

THE
PROCEEDINGS
OF THE
ENTOMOLOGICAL SOCIETY
OF
LONDON
1918.

LONDON:
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1918-1919.

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FOR THE YEAR 1918.

Wednesday, February 6th, 1918.

Dr. C. J. GAHAN, M.A., D.Sc., President, in the Chair.

Nomination of Vice-Presidents.

The PRESIDENT nominated Dr. H. ELTRINGHAM, Mr. A. H. JONES and Mr. S. A. NEAVE as Vice-Presidents for the ensuing year.

Election of Fellows.

Dr. JOHN ADAMS COMSTOCK, Curator of the South Western Museum, 1275 Bellevue Avenue, Los Angeles, California, U.S.A., and Mr. JAMES W. MONRO, Lieut. R.A.M.C., 2nd Sanitary Coy., Duke of York's Head Quarters, Chelsea, S.W., were elected Fellows of the Society.

Exhibitions.

A BEETLE NEW TO BRITAIN, AND ANOTHER HITHERTO VERY RARE. Mr. DONISTHORPE exhibited a ♂ and ♀ of *Caenocara sylvatica*, Muls., a beetle new to Britain which he had bred
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from a "puff-ball" (*Lycoperdon gemmatum*) taken at Barton Mills, Suffolk, on September 9, 1917, together with a specimen (♀) of *Caenocara boristae*, Hoff., swept at Battle, Sussex, on August 2, 1902, the only species of this genus known to occur in Britain heretofore.

Also specimens of *Cryptophagus lyendali*, Ganglb., which he had found in large numbers in a nest of *Vespa germanica* in a tree in Richmond Park on November 20, 1917; a species of which only two specimens had been taken in Britain before, by Mr. Champion in July 1907, in a hollow in an old beech tree in the New Forest. Mr. Donisthorpe made some remarks on the habits, distribution, etc., of these exhibits.

HEMIPTEROUS OVA.—Mr. E. A. BUTLER exhibited ova of the following species of Hemiptera :—

Two species of Pentatomidae, *Piezodorus lituratus*, Fabr., and *Pentatoma rufipes*, L.; emergence from these is effected by lifting a lid from the anterior end of the egg; according to Fabr. the embryo is aided in doing this by an apparatus consisting of a thin membrane strengthened by a triradate chitinous framework, which could be seen in the group from *Pentatoma*. *Chorosoma schillingii*, Schml., a Coreid bug, emergence from which is effected also by lifting a lid, but without the accessory apparatus. Two species of *Berytus*, in which the ovum is elongate and longitudinally sulcate, and emergence is effected by the longitudinal fission of the egg at the anterior end. Three Reduviidae, *Coranus subapterus*, L., *Nabis majus*, Costa, and *Nabis rugosus*, L. The two species of *Nabis* have the shape of a short test-tube bent at the open end and with the mouth placed obliquely. A Capsid bug, *Miris laevis*, to which were added the five cast skins representing the five larval instars of the individual produced from the single ovum exhibited; and lastly, the ova of three water bugs—*Naucoris cimicoides*, L., *Notonecta glauca*, L., and *Nepa cinerea*, L.

TWO SPECIES OF CATAGRAMMA, AND A NEW DYNAMINE.—Mr. KAYE exhibited from Mr. Joicey's collection series of the two *Catagramma* species *pastaza* and *excelsior* with races and forms of each pointing out that the two groups of insects were at once separable by the different tips to the antennae.

Pastazza and its forms *speciosa* and *excelsa* having a wholly black club, while *excelsior* and its forms *ockendeni*, *elator*, *michaeli* and *excelsissima* have the apical half of the club ochre yellow. This point of difference did not seem to have been detected by Staudinger, who first described *pastazza* as a form of *excelsior*, as he differentiated his *pastazza* by wing colouring. The *excelsior* of Hewitson, figured ff. 49, 50, Cat. vii. appears to be, if not unique, excessively rare. As it is close to *excelsior elator* it might be found in the same localities in Ecuador, notwithstanding the locality given, "Amazon." Other races of *excelsior* are also rare: *michaeli* from the Solimoes River and *excelsissima* from the Madeira as well as *elator* from Ecuador are all scarce, *ockendeni* alone having been secured in some numbers in the Chanchamayo district of Peru. In tabulated form the two species work out thus:—

Catagramma pastazza pastazza, Stgr., with ab. *speciosa*,
S.E. Peru.

Catagramma pastazza excelsa, Rüb. (nec Stgr.).
Ecuador.

— — —

Catagramma excelsior ockendeni, Obth.
S.E. Peru.

Catagramma excelsior elator, Obth.
Ecuador.

Catagramma excelsior excelsior, Hew.
"Amazon."

Catagramma excelsior michaeli, Stgr.
Solimoes River.

Catagramma excelsior excelsissima, Stgr.
Madeira River.

A striking new species of *Dynamine* from Bolivia was also exhibited, *D. agatha*, recently figured by Oberthür, *Lip. Comp.*, xii, pl. cldvi, fig. 3493, but undescribed.* The

* Fore-wing deep velvety black with the base a brilliant blue and a broad outer marginal band of the same colour broadest on the costa, where it forms a sort of nail-head shape and tapering rapidly from

species was wrongly identified by Staudinger in "Iris," vii. p. 225, where he refers to the most splendid of the *Dysmanthe* species *perpetua*, going on to describe a black insect with steel-blue bands on the fore-wing and on the hind-wing. *Perpetua*, described by Bates in the "Journal of Entomology" (1865), p. 326, is a green species and has nothing to do with the present insect.

He further exhibited from his own collection an association of Heliconine forms from Para, all taken in the months July and August 1917. There were seventeen *H. melpomene theliope*, mostly fairly typical, nine *H. erato amazona* and three *Eueides tales pythagoras*. Although *Heliconius melpomene theliope* here appeared to act as the model it was not really so, as *H. erato amazona* was certainly the commoner butterfly of the two at Para, while the *Eueides* always was third in point of numbers, and in any case reinforced the *amazona* owing to the manner of the streaking. It was probably true that *H. erato amazona* appeared a little earlier than *H. theliope*, and thus advertised the colour scheme a little in advance, so that it was possible that at the end of the time of appearance *theliope* might sustain few attacks, although be present in some numbers. It was obvious from the specimens that *amazona* had been out some time, as all the specimens appeared orange and not rosy red as in fresh specimens.

A second small association was a well-known one in point of species, but little or perhaps unknown as to locality. The species were *H. melpomene nanna* and *H. erato phyllis* and the locality Pernambuco. There were four specimens of the former and two only of the latter; here again the semine

vein 3 to inner. Hind-wing deep velvety black with a large oval patch lying along outer margin between vein 4 and tornus.

Underside of fore-wing blackish with the greater part of the cell ochreous except for two black marks edged above with blue. Three white spots forming an oblique apical band, a white spot within the cell and a dirty white spot near tornus. A double blue subterminal as far as vein 3. Underside of hind-wing dirty whitish with three nearly parallel oblique brown bands, the two outer ones united above the cell by an interrupted blue band. Two eye spots, the upper, the larger, surrounded with an ochre yellow ring and placed on a purplish patch. A regular ochre narrow submarginal band narrowly edged with blue. The underside is very similar to *Dynamine onias*, underside white, the upperside strongly suggests *Eunica flora*.

model being *naana*, while in reality it was *phyllis*, for by the condition of the specimens it was probable that *phyllis* was going over, and it was well known that *H. crato phyllis* was always abundant wherever it occurred. *Naana*, reaching so far north as Pernambuco, was of special interest, and from the four specimens fairly constant, only one showing a horizontal red streak below the yellow transverse hind-wing band.

PSEUDACRAEAS IN MIMETIC ASSOCIATION. Lord ROTHSCHILD exhibited a series of Pseudacraeas in illustration of a paper on the mimetic associations of these butterflies which would shortly appear.

A NEW FORM OF PSEUDACRAEA POGGEI, DEW., MIMICKING THE DORIPPUS, KLUG, FORM OF DANAIIDA CHRYSIPPUS, L., IN EX-GERMAN EAST AFRICA.- Prof. POULTON said that he had recently received four letters and three consignments from Capt. G. D. H. Carpenter, who had written from Lulunguru on the Central Railway, 17 miles W. of Tabora, at a height of 5766 ft. From these letters he had arranged the following communications, of which each section bore the date of the letter to which it belonged.

Nov. 5, 1917.—“I have had a piece of stupendous luck and hasten to tell you. A few days ago, on the small kopje of granite behind the camp, about 300 ft. high, I caught what I took to be, at first, a couple of *Hypolimnas misippus*, L., the ? variety [*inaria*, Cram.] without apical black and white markings. When I had caught them I thought they looked a little odd, but as I have not caught a large number of *misippus* and have not handled it much, and it's some time since I caught one, I thought I must have forgotten the details of its appearance, and put the specimens away for a time. (Can you guess what's coming?) Next day I caught a female of the type and felt quite sure then that I had got *Pseudacraea poggei*, Dew., and it was soon certain when I caught a genuine *misippus* form *inaria* and then a male *poggei*. I am now sending you, by registered post, in a chocolate box by themselves these most exciting specimens—three of the type and two of the variety, together with the variety.

"I have caught lots more. Yesterday (Nov. 4) I got four more of type and two of the variety, and these will soon be sent in a large biscuit tin, which is almost ready. This morning I caught 10 more of the type."

Nov. 14. "Since then I have been catching some daily and must have got at least 50 specimens with a dozen of the variety, all in prime condition. It seems remarkably uniform—I have caught no intermediates between type and variety."

Nov. 5. "Is it not splendid for me, for I have always longed to meet this most splendid mimic, firstly because it is of the *chrysippus* association and such a beautiful mimic, secondly because it is one of my pet genus! But I had never expected to get it, since I understood it has always been looked at as a S. African form—though I don't know how far north it is known to extend. Still, Lulungu must be some hundreds of miles further north of its previously known area. What excites me most, however, is the unicolorous variety, for I cannot remember that it has been described. If it is really new I shall burst! Put me out of my anxiety as soon as you can!"

Nov. 14.—"I have only seen them on the top of the kopje and have never seen a *chrysippus* there! [A ♀ of type was taken Dec. 31.] With *poggei* is an occasional *misippus* (I have caught two and seen a third), and the differences are interesting. *Misippus* looks larger, its flight is much more floating and soaring: it is very much more wary and hard to catch: it sometimes settles on the underside of a twig, as if to conceal itself—indeed, I find it hard to believe, as I think you believe, that it is Syn- and not Pseud-aposematic."

Nov. 5 and 14.—"*Poggei*, on the other hand, in the first place has a richer quality in its colouring which sometimes looks more reddish than brown in a fresh specimen: its flight is heavier and not floating, being more like that of *chrysippus*; it is much bolder and less wary than *misippus*, and if struck at will nearly always return on its tracks, so that one can be certain of catching it, as it often comes back right up to the net to investigate it. It often settles openly on the tops of low twigs or a branch or on the ground, and waves

its wings slowly up and down. In fact it almost behaves like a true aposematic species. *Chrysippus* itself is quite as easily alarmed, and indeed I think more so! I certainly agree with a statement I remember to have seen somewhere that *poggei* is the best of all mimics of *chrysippus*. It is easier to catch than any other *Pseudacraea* I have caught - *holleyi*, Neave, *lucretia*, Cr., *kuenowii* *hypocantha*, Jord., or *gentis*, Cr."

Nov. 5. -- "There is a Rhodesian here and he says the style of country is exactly like parts of N. Rhodesia - granite kopjes rising out of flat plain, with no actual forest, but small trees fairly close together. The butterfly haunts two foci of circumscribed area on the very top of the kopje. They are nearly all beautifully fresh specimens, whose colouring has a very rich appearance, and in some lights has a more reddish tint than either *chrysippus* or *misippus*.

"I am more excited over this find than I have been over any butterfly matter since I reared *Pseudacraea terra*, Neave, or my *planemoides*, Trim., family of *P. dardanus*, Brown. I wish it did not take so long to hear from you!"

Nov. 27. -- "*Poggei* goes merrily on - I continue to catch them, but only the best specimens - and get the variety quite often. It seems remarkably fixed and definite - I have only once taken one that shows any intermediary stage - as you may see in the model where the white bar is not quite brown, and there is a little more black at the apex than there should be."

Dec. 7. -- "*P. poggei* is one of the commonest butterflies on the kopje! It is by far the best mimic of *chrysippus*. Not only in close similarity of pattern but in flight is this so - and it is remarkably un-shy! I have had one settle on my helmet - and they frequently come so close to investigate the net that they almost fly into it, and have even settled on it! The flight is slower and more flapping than that of any other *Pseudacraea*, and has very little of the soaring quality shown by *lucretia*, *boisduratii*, Doubl., or the forms of *eurytus*, L. It will always return to the same spot, flying backwards and forwards, and sometimes settling quite near to, or even on,

the ground. It is noteworthy how *missippus* differs. It is excessively wary, goes off like a shot if struck at, never settles on the ground, but often on the underside of a spray quite high up, when it waves its wings, a habit to which *poggei* is very little addicted. I have watched with some interest to see whether ♂ *missippus* would be deceived by *poggei*—but have seen nothing that would lead one to suppose he was; but I have seen at Kakindu, most unmistakably, a ♂ *P. dardanus* deceived by *Amauris niarius*, L., which he mistook for his own mimetic ♀, suddenly arresting himself in headlong flight to dally a while with the attractive-looking stranger before finding out his mistake!"

Prof. Poulton said that Fellows could well imagine how interested Roland Trimen, their ex-President and dear friend of so many of them, would have been at this discovery. He had often spoken with enthusiasm of the wonderful mimetic resemblance of the type form of *poggei*, now completed by Capt. Carpenter, to whom Prof. Poulton was sure they would wish to offer their congratulations.

Four examples of the new form were exhibited to the meeting, together with eighteen of the type, including a male captured in the same locality on July 27, 1917, and sent in a previous consignment. This latter specimen, although evidently fresh, had been seriously injured, probably by a bird or lizard, nearly the whole of the left hind-wing having been torn away.

[Concerning this specimen Capt. Carpenter wrote Jan. 25, 1918: "I hope you will publish the fact that I was completely deceived by the first *P. poggei* I caught. I expect I thought it was *missippus*, and not having my attention particularly directed to it put it away without studying it! It is, however, just possible that I noticed its damaged hind-wing, and thought I would send a specimen of damaged *chrysippus*, and did not study it carefully. Whatever the explanation I am delighted to think I've been had again!" (For the first *P. dardanus* form *plumemoides* I sent home from Jinja [captured Aug. 1-15, 1910] and said nothing about it—did not even remember catching it until you pointed it out to me in 1913 when I got home.)"]

Exclusive of this specimen, Capt. Carpenter's captures were as follows :

<i>Pseudacraea pygmaea</i> , Dew.		
1917.	Type form.	Form <i>carpenteri</i> .
Oct. 29	—	2
Nov. 3	3	—
„ 4	4	2
„ 5	10	—
„ 6	8	1
„ 7	3	2
„ 8	2	1
„ 9	5	2
„ 10	3	1
„ 11	2	—
„ 12	4	—
„ 13	5	1
Totals	49	12

The whole of these were males except two of the type form, captured Nov. 3 and 5 respectively. Thus the proportion of *dorippus*-like var. to *chrysippus*-like type was almost exactly one to four.

[Since the above was written Capt. Carpenter continued to make captures up to Jan. 2, 1918, just before his stay at Lalangum came to an end. His total captures were 108 males and 3 females of the type form, 31 males of *carpenteri*—a proportion of 1 to 3½. The third female was taken *in cop.*, and carrying the male, on Dec. 6. The female of Nov. 3 shows the most considerable, although very minute, approach towards *carpenteri* of all the 111 examples of the type, as shown in the degree of development of orange along the costa and in two small internervular spear-head-like patches in the angles

of areas 7 and 8. These patches are distinct on both surfaces, but especially on the under. In addition to the specimen taken on July 27, a male of the type form taken Dec. 15 exhibits extensive injuries evidently inflicted by enemies, the anal quarter of both hind-wings being torn away symmetrically. Furthermore, 22 males of the type form and 7 of *carpenteri* exhibit smaller injuries, of which the great majority were inflicted at the anal angle of the hind-wing, and, from their form, almost certainly by birds. Two female *H. missippus* accompanied the *Pseudacraeas*—one of the *inaria* form "caught at the same time and place as *poggei*" on Nov. 3, and one *missippus* with slight development of white on the hind-wing, taken Nov. 11.]

Capt. Carpenter had not as yet recorded the proportion of *dorippus* to *chrysippus* at Lulanguru and adjacent localities, but further to the east and north it was known that *dorippus* largely predominated. Thus Capt. W. A. Lamborn had written on June 3, 1916:—

"I have been much struck by the abundance of *dorippus*, the type form being almost absent. *Inaria* also seems to be more numerous than the type, and *eucedon* is almost invariably a brown form [*daira*] without any subapical bar at all." Out of 10 *D. chrysippus* collected by Capt. Lamborn in north central ex-German East Africa, to be recorded with precise localities by Dr. Eltringham in our Transactions for 1917, 33 were *dorippus*, 3 *albinus*, Lanz. (a more or less white-hind winged *dorippus*), 3 *chrysippus*, and 1 with less white on the hind-wing than *alcippoides*, Moore. Out of 21 *Acraca eucedon*, L., 16 were *daira*, Godm. and Salv., 3 *eucedon* (one approaching *infusca*, Staud.), and 2 *lycia*, F.

Capt. Carpenter's captures were made on what was probably the border of the area in which the above proportions obtained, and it was likely that if the *Pseudacraea* had penetrated still further into this area the proportion of the new form would be found to be much higher to the north and east.

Mr. S. A. Neave, who had had an extensive experience of the type form of *P. poggei* some three or four hundred miles south and a little to the west of Lulanguru, wrote to Prof.

Poulton from Kambove in the S.E. of the Congo State, Nov. 14, 1907: "I still think *P. poggei* the best mimic of *Darvida (Limnas) chrysippus*, even better than *misippus*- its flight is so extraordinarily like that of the model. It is rather, I think, a significant fact that of all the *Pseudacraea* I have met with (5 spp.) *poggei* is by far the most abundant; while it is bold, and not afraid to expose itself on the wing" (Proc. Ent. Soc., 1908, p. xv).

Mr. Neave had written on Jan. 15, 1918: "That is most exciting about a new form of *P. poggei*, mimicking *dorippus*. It is suggestive that, from the description of the locality, it must be decidedly more lightly wooded and therefore presumably drier, than those in which the type form occurs in N.E.R. and Katanga. The haunting of 'circumscribed areas on the top of a kopje' is of course a habit of many butterflies, but the only *Pseudacraea* I have seen do it is *P. boisduvali*."

A little later Mr. Neave wrote, after seeing Capt. Carpenter's letter: "I return herewith Carpenter's letter, which I have read with the greatest interest. I myself took *poggei* chiefly at medium elevations, viz. from about 2500-3500 ft., but it occurred up to 4500 ft. on the high plateau S. of Tanganyika. It was most numerous in the valleys of the larger rivers, such as the Lualaba and Luapula in Katanga and the Kalungwisi and Chambezi in N.E. Rhodesia. It is on the wing all the year, but is most abundant toward the end of the wet season, at which time it is to be found in woodland country among comparatively small trees, much as Carpenter describes. At the height of the dry season, I only found it in patches of denser forest with larger timber.* I have not observed any special association of this species with the tops of small hills and kopjes, but there is little of this type of country within the area it frequents in Rhodesia and Katanga.

"With regard to its flight and appearance on the wing I fully endorse Carpenter's statements. At very close quarters one would be perhaps inclined to mistake it for a female of *H. misippus*, but at a little distance, especially when on the wing, I myself found it almost impossible to distinguish

* The habits were also recorded by Mr. Neave, together with the exact resemblance to the model, in Proc. Zool. Soc., 1910, p. 35.

from *chrysippus* except in the case of very fresh specimens, which are a trifle brighter in colour. This superiority of resemblance over *misippus* or the other mimics of *chrysippus* is, I think, mainly due to the *flight* being so much more like that of the model. Though hardly so regardless, or rather unconscious, of danger as *L. chrysippus* appears to be, it is remarkably bold on the wing and decidedly easier to catch than *misippus*.

"The resemblance on the wing between *P. poggei* and its model is so close that it suffices to deceive the insects themselves, and on at least one occasion I have seen one of each species chasing the other, and flirting together for several seconds before discovering their mistake.

"Carpenter's discovery of a form resembling the *dorippus* var. is of the utmost interest, more especially as his description of the locality indicates a decidedly drier region than those I found the insect in, and therefore one in which this variety of the model may well be the dominant one."

Pseudacraea poggei, *Deur.*, forma *nimeticæ* n. *carpenteri*.
The differences between *carpenteri* and the type form are almost confined to the fore-wing, just as those between *dorippus* and *chrysippus*. In the following description the fore-wing is always to be understood when the hind-wing is not specially mentioned. The essential difference between *carpenteri* and the type form is a reduction in the black fore-wing markings and the replacement of the white by a paler tint of the orange ground-colour, changes which transform the butterfly from a mimic of *chrysippus* into a mimic of *dorippus*.

The reduction of black.—This reduction is chiefly manifest in the apical region of both surfaces and is remarkably complete, leaving no trace of an edging to the vestigial oblique bar such as is often seen in other mimics of the same model, and especially strongly in the *inaria* ♀ of *Hypolimnias misippus*. The black apical area persists as a marginal band nearly uniform with that round the hind-wing and other parts of the fore-wing as in *dorippus*. Within this apical margin scattered black scales only exist in sufficient numbers to produce a distinct effect in relatively few specimens, and these

are not the individuals which retain the clearest traces of the white bar and white spots.

Reduction of black also occurs at the end of the cell, although the retention of this marking of the type would perhaps have promoted the resemblance to *dorippus*—a resemblance certainly attained in the *inaria* ♀ of *missippus* by the persistence of a part of the black markings of the type, as is well shown in figs. 5 and 4 on Plate XIV of Trans. Ent. Soc. for 1905. At the same time, as is also shown on fig. 3 of the above plate, the black mark placed at the end of the short cell of *poggei* is of a very different form from that which partially surrounds the end of the longer cell of *dorippus*. The resemblance in *inaria* is mainly attained by the retention of part of the black area altogether beyond the end of its cell, but in a position corresponding with the end of that of *dorippus*.

A third black marking reduced in the *carpenteri* form is the short internervular black streak near the base of area 1b (shown faintly in fig. 3 of the above-mentioned plate, but more distinctly in fig. 3a, representing the under surface). This streak, occasionally vestigial on the upper surface of *poggei*, appears to be always absent or vestigial on this surface of *carpenteri*.

In both it remains distinct on the under surface, and when well developed above it is still larger and usually of a deeper black below. In a relatively few of the type form there is a small black spot between the median and the junction of the outermost quarter with the rest of the streak. Below this spot also is more distinct and sometimes fuses with the streak.

The strongly marked blackened veins of the upper surface of *poggei* and its variety may be secondarily mimetic of the ♀ *H. missippus* and its form *inaria*. In both mimetic species they are far more prominent than in the models.

The black spots on the under surface of the hind-wing of both *poggei* and the form *carpenteri* are very variable in shape and often asymmetrical. The two small additional spots in areas 4 and 5 observed in a single one out of seventeen specimens from the sources of the Congo and represented in Trans. Ent. Soc., 1905, Pl. XIV, fig. 3a, were found in one

Lulanguru poggei out of twenty-nine examined, and of a much smaller size, in one *carpenteri*, and still smaller and in area 5 of the right side only in another, out of eight examined. In a few specimens of both forms the lower discocellular is blackened on one or both sides, representing a vestige of the lower of these two additional spots.

The occasional appearance of these minute spots and an additional one in the hind-wing cell, as well as the variable condition of the basal streak in area 1b are of much interest, for they represent features strongly marked in *Pseudacraea clarkii*, Butl. In this latter species the spots appear on the upper surface, although more strongly developed, as also the streak, on the under (Trans. Ent. Soc., 1892, Pl. X, figs. 1. 1a).

The evanescence of the oblique white bar and white spots.—The transformation is effected by the scales becoming in part of a pale orange colour and in part of a darker orange, like the ground-colour of the fore-wing. In some individuals a relatively few, and in one (out of eight carefully examined) a high proportion, of the white scales are retained—a persistence especially marked in the pair of submarginal spots in areas 2 and 3. The pair of spots or only one of the pair in area 1b are quite as often present in *carpenteri* as in the type, and these also, although very small, tend to retain the white scales. In both type and variety this pair is often present or better developed on the under surface when absent from the upper or feebly developed on it. It is probable that the whiteness of these pairs of spots, especially those in areas 2 and 3, is mimetic of the marginal pattern of *dorippus* which is strongly developed in the same areas, especially in ♂.

Although always obvious on examination by its paleness as compared with the ground-colour, the oblique bar would be invisible in flight or at a little distance during rest. Its edges, especially the inner, are dyslegnic, contrasting sharply with the eulegmic bar of *poggei*. The costal extremity of the latter bar is formed by a fine white streak, of which traces are often retained by *carpenteri*, suggesting at first sight mimicry of the costal spots of *dorippus*, but it is unlikely that so fine a streak would be visible. In *inaria*, however, the retention of the costal extremity of the same feature,

and of a pale costal spot on its basal side, appears to be clearly mimetic.

On the under surface of the fore-wing the mimicry of *carpenteri* is far closer than that of the type, because of the differences in the apical section. Here the black area of the type is overlaid by streaks of white scales, producing a very imperfect resemblance to the characteristic pale tint of *chrysippus* in the same region of the under surface. In *carpenteri* the white covering scales are retained, and these, combined with the orange scales which have replaced the black (as well as the white over the site of the bar), produce a resemblance to the corresponding part of *dorippus* which is far closer than that between *poggei* and *chrysippus*.

The last point concerns the ground-colour of both fore- and hind-wings, and its resemblance to that of the models. In Ethiopian examples of *chrysippus* the upper surface of the fore-wing is generally of a darker Sienna brown than the hind, and increases in depth of shade towards the costa. The fore- and hind-wings of *dorippus* are more nearly of the same tint and much paler than the usual tint of Ethiopian examples of *chrysippus*, being of a brownish orange and sometimes of a pale, sand-like colour, and the costal darkening is less marked or wanting altogether. In *carpenteri* also the fore-wing is paler than in the type and less darkened towards the costa, producing a more uniform appearance clearly mimetic of *dorippus*.

It is of special interest that, as Capt. Carpenter has remarked, the dimorphism between the two forms of *Ps. poggei* should be so complete—far more so than in the females of *H. misippus* or the *daira* and type forms of *Acraea eueodon*. The only mimic of *chrysippus* which approaches *poggei* in this respect is *Mimacraea marshalli*, Trim., with its *dorippus*-like race *dohertyi*, Rothsch., but this latter has not yet been found in the same locality as *marshalli*, so that true dimorphism has yet to be proved for the species.

Among the fifty examples of the type form from Lulanguru, a single one, a female captured Nov. 3, exhibits a slight but distinct trace of orange scaling on the black apical area beyond the white bar of the fore-wing upper surface (see p. ix).

[The above description, although originally drawn up from the specimens captured up to Nov. 13, is applicable to the entire series, now carefully examined. Specimens with traces of the extra black spots on the hind-wing under surface were as numerous in the later captures as in the earlier. A few of the later *carpenteri* showed interesting vestiges of the type pattern towards the apex of the fore-wing.]

A comparison between the details of the mimetic likeness borne by *poggei* and the ♀ *missippus* to their model, and between the patterns of the co-mimics themselves, was published by the present writer in Trans. Ent. Soc., 1905, pp. 265-7. At that time I was not aware of the critical comparison between the same forms which the late Mr. Roland Trimen, F.R.S., had published at a much earlier date, in Proc. Zool. Soc., 1891, p. 79, based on a single male from Omroora, Angola, which corresponded in size "with the smaller than usual *D. chrysippus* from the same locality." Mr. Trimen found that *poggei* was a closer mimic than the ♀ *missippus* in three features: "On the upperside of the fore-wings the much narrower costal black and the absence of the apical white spot, and on the upperside of the hind-wings the narrower, less diffuse, inwardly more sharply dentate hind-marginal black border. On the other hand, the greyish-white clouding on the underside of the apex of the fore-wings and the conspicuous spotting of the abdomen are points which lessen *D. [P.] poggei*'s likeness to *D. chrysippus* as compared to the colouring of the corresponding parts in *D. missippus*. These two characteristics and the subbasal black spots on the underside of the hind-wings are retained generic features of *Pseudacraea*, quite peculiar and unmistakable. . . . The rufous-ochreous ground-colour of the wings exactly accords with that of *Danaus chrysippus*, and the paler tint of the hind wings is most perfectly reproduced; while on the underside the creamy ochre-yellow ground and the white neurulation and black border of the hind-wings (with also a general resemblance in the few white-edged black spots) are precisely simulative of the *Danaus*."

The distribution of the type form of *Pseudacraea poggei*. - The exact distribution of this beautiful mimic becomes a

subject of the greatest interest now that Capt. Carpenter has discovered the appearance of its new form on the borders of the very region where *chrysippus* is mainly replaced by *driip*, *as.* The distribution of the type form of *paggei*, as given by Aurivillius in "Seitz" (vol. xiii, p. 197), is Angola, Southern Congo and Rhodesia, a summary in every way confirmed by the following data kindly supplied by Lord Rothschild, Mr. S. A. Neave and Mr. J. J. Joicey, as well as by the material in the Hope Department.

ANGOLA.—At Tring, 13; collected by Dr. Ansorge. Mjene Indale, 2 (also 3 at Witley); Guimbungo, 2; Samba Acenda, 2; Mikenje, 1; Makweha, 1; Marimba, 1; Bang Ngola, 1; Camba Caquenje, 2; Katole, Jinga Country, N. Centr. Angola, 1.

At Tring also from the following localities: Loanda, 1 (ex Honeyer Coll., co-type); Ceramba, Bihé, 4 (W. C. Bell); Bihé, 3 (Edw. Sanders); also 3 at Witley.

Quoted by Roland Trimen in P.Z.S., 1891, p. 79: Omrora, Ambella Country, 1 (Erikson); Central Angola (Pogge), 2.

Among the above examples of the type a single one, from Ceramba, Bihé, is a faithful mimic of a *D. chrysippus* with hind-wing pattern intermediate between the type and *driipus*.

S. CONGO STATE AND N.E. RHODESIA.—Mr. S. A. Neave has kindly added the following account of the distribution of *P. paggei* in the above area, in amplification of his brief note in Proc. Zool. Soc., 1910, p. 35: "I have been looking up my notes on *Pseudacraea paggei*. I should describe it as by no means 'uncommon throughout Northern Katanga (in the southern portion of the Congo State), and the plateau of N.E. Rhodesia N. of a line somewhere about the S. end of L. Bangweolo. In my experience it does not occur on the Zambesi side of the watershed, though I should not be surprised to hear of it being found in Northern Nyasaland. I have an idea that I have seen or heard of examples from the Karonga district of Nyasaland, *i. e.* the extreme N. of the protectorate, and one would expect it round the shores of Tanganyika."

The following account of the model and co-mimics of *P. paggei* was published by Mr. Neave in his memoir "Butter-
PROC. ENT. SOC. LOND., I. 1918.

flies from Northern Rhodesia and adjacent Territories" in Proc. Zool. Soc., 1910:

Dasia chrysippus, L.—"A common insect everywhere, but prefers open country and avoids very dense forest. The specimens are mostly of the type form with occasional individuals tending to var. *oleippus*, Cram. I saw one specimen of the *oleippus*, Klug. form in the mid-Chambezi Valley in May, and found it not uncommon a few miles above the mouth of the Lofu river, near Lake Tanganyika, but did not meet with it to the south of these localities" (p. 7).

Acras evedon, L.—"I took this everywhere. The type form is perhaps the commonest, though not much more so than *deira*, Godm. and Salv. The *lycia*, Fabr., form occurs rarely in Katanga and more commonly in the valleys of the Kalungwisi and Lofu rivers in N.E. Rhodesia" (p. 27).

Mimacra marshalli, Trim.—"I took about twenty individuals of this fine species in the Lualaba Valley, iv. and v., and one other later in the year, x. I also saw a few individuals in the Chambezi Valley, iv. and v. These Central African specimens seem to be slightly more heavily marked than those from Mashonaland. I found its habits and the nature of its habitat very much as Marshall describes,* but did not observe it settling head downwards on the trunks as he records. . . . I was lucky enough to capture, on more than one occasion, both this species and *Pseudacra puppi* as well as their model *Limnas chrysippus* within a few yards of each other" (p. 42). Mr. Neave's photograph of the insect at rest, reproduced on p. 42, was taken in the Chambezi Valley.

Hypolimnas misippus, L.—"Occurs everywhere during the wet season, but is nowhere abundant, especially in Katanga, though fair numbers of males are sometimes seen. The typical and *inaria* forms of female seem to occur in about equal proportions" (p. 31).

Mr. Neave preserved as a separate series and presented to the Hope Department the most striking examples of *P. puppi* and the above-mentioned model and co-mimics, captured

* Trans. Ent. Soc., 1902, p. 472.

Locality in E. Africa (N.E. of Zanzibar)	Dates in 1907 and 1908.	<i>Danaida chrysippus</i> .	<i>Acrura eucledus</i> , type form.	<i>Pseudaerwa peggei</i> .	<i>Mimastaca marshalli</i> .
1907					
Luabala Valley, N. Kabali River, nr. Mazanzani: 3000 ft., April 18, 22, 24, 25, 26 and 27.	Apr. 18	—	4 (10 others seen)	1 (1 other seen)	3 (1 other seen)
	" 19	—	—	—	2
	" 20	—	—	—	1
	" 21 (All within 1-mile on same path.)	1	1	—	1 (also 1 <i>M. skoptides</i>)
	Apr. 22	1	—	—	1
	" 26 (All in about 1-acre of native clearing.)	1 (7 or 8 others seen)	1 (5 others seen)	1	1 (on edge of forest, other species in open)
	Apr. 27	(Numbers seen)	1 (numbers seen)	6	—
	" 29 (Native col- lectors)	7	3	1	—
	Apr. 30	1	—	—	3
	May 1	—	—	1	—
Luabala River: 2000 ft.	" 2	—	—	3	—
	" 3	—	—	1	—
	" 8	—	—	—	1
	" 9	1 (mistaken for <i>peggei</i>)	—	1	—
	" 11	—	—	—	1
Luabala River, Nzilo Gorge: 3000 ft.	" 13	—	—	2	—
	June 5	—	—	1 (very worn)	—
Nr. Kiapo, lower: about 4200 ft.	" 10	—	—	1	—
1908					
Chambiizi R. near Nyamizi: 4200 ft.	Apr. 14	5	—	1	—
	" 15	4	1	—	1
Chambiizi R., Mpika- Kasoma Rd.	May 1	1	2	1	—
Luena distr. and E. shore of L. Ba- ngweolo	June 8	3 (seen)	—	1	—
Lawingi, N. of L. Bangwe- olo: 4000 ft.	Sept. 30	1	—	1	—

SOUTH EAST CONGO RIVER, K. K. K. K. K.

SOUTH EAST RIVER, K. K. K. K. K.

together, and these were exhibited to the meeting. This series is shown in full on p. xix, in a table to which Mr. Neave has kindly added notes from his journal as well as the record of additional specimens.

With reference to the localities Mr. Neave points out that, in some older maps, the Luapula, after leaving Lake Mweru (it is generally called the Luvua beyond the lake), is named "Webb's Lualaba," which must not be confused with the real river of that name—the one we are dealing with which is much further west.

In Mr. Neave's opinion the three dates printed in heavy type in the Congo list, viz. April 18, 26 and 29, 1907, are the only ones that give an accurate record of the *proportions* in which the insects occurred. At the same time the other less complete data are of value in confirming the conclusion that the insects are found in the same places, and often at the same time.

A large proportion of the specimens of all the species in this table is kept together as a special series in the bionomic collection of the Hope Department—a series of which Dr. Eltringham wrote: "The general effect of the group as seen together is that they are all alike, and when they are arranged in haphazard manner there is a distinct sense of effort in counting the respective numbers of the different species. I know of no instance which could illustrate more forcibly the reality of the resemblance" ("African Mimetic Butterflies," Oxford, 1910, p. 38).

In addition to the bionomic series many of the other specimens recorded in the table are arranged in the systematic collections of the Hope Department, together with the following examples of *P. poggei* taken by Mr. Neave in N.E. Rhodesia: Lower Chambezi Valley, Kasama distr., 3000 ft., 2; Luwingu, N. of L. Bangweolo, 4200 ft., 1; Luwingu to mouth of Chambezi R. in L. Bangweolo, 2; high plateau between L. Tanganyika and the Lofu R., 4200-4500 ft., 3 (one of these exhibits an injury probably caused by an enemy and noted before capture).

A series of *P. poggei*, taken by Mr. Neave in the Lualaba Valley, Katanga, contains the only examples of this species

in the British Museum. They include some of the specimens recorded in the table on p. xix.

In addition to Mr. Neave's captures the following records from S.E. Congo and N.E. Rhodesia have reached me :

At TRING : Riuwe R., Lualaba Valley, near Katanga, S.E. Congo, 1; Fort Rosebery, about midway between L. Bangweulu and the Luapula R., N.E.R., 2.

At WITLEY : N.E. Rhodesia, 5; Chambezi R., N.E.R., 5; Katonga R., a tributary of the Upper Chambezi R., N.E.R., 1.

THE NEWCASTLE MUSEUM : Johnstone Falls, Luapula R., N.E.R., about midway between Mr. Neave's Congo and N.E.R. localities, 2 (formerly in the collection of Dr. H. Eltringham).

THE HOPE COLLECTION.—In addition to Mr. Neave's series a very interesting collection of *poggei*, its model and co-mimic was presented by Sir Horace Byatt (Trans. Ent. Soc., 1905, p. 263). The proportions of *poggei*, *chrysippus* and *misippus* in the locality Kayambi, Awenba Country, N.E.R., near the Chambezi R., $9^{\circ} 20' S.$, $31^{\circ} 50' E.$, at a height of 3950 ft., are shown with singular completeness, inasmuch as the insects were captured indiscriminately by native schoolboys, collecting, Oct. 1898-Jan. 1899, for Père Guillemé. Out of about 1200 butterflies in the collection the following fell into the *chrysippus*-centred combination :

<i>D. chrysippus</i> , type form	367
„ <i>dorippus</i> form	42
<i>P. poggei</i> , type form	17
(<i>H. misippus</i> , non-mimetic ♂)	36)
„ type ♀	7
„ <i>inaria</i> ♀	2
Total	441

The proportion of *poggei* to *chrysippus* was therefore about 4½ per cent (1:63; the percentage 1:72 is erroneously given in the paper). Sir Horace Byatt's remarks on p. 265 are of much interest in relation to Capt. Carpenter's recent discovery. *P. poggei* "is purely a mimic of *chrysippus* and shows no approach to dimorphism. This is explicable on the

ground that it is found only where *chrysippus* is the largely predominant form, and, so far as is known, it does not occur in, or has not yet reached, the parts where *dorippus* is relatively abundant—that is, the desert strip along the E. coast, extending in the E. African Protectorate inland at least to the shores of Victoria Nyanza."

OTHER LOCALITIES.—Except for Capt. Carpenter's recent captures only two other records are known to me: (1) "a female in the collection of Mr. Hobley which was taken in German East Africa" (Eltringham, "African Mimetic Butterflies," p. 35). It may be conjectured that the specimen came from near the E. shore of the Victoria Nyanza, for Mr. C. W. Hobley's collection was largely made in the adjacent Kavirondo-Nandi district (Trimen, Proc. Ent. Soc., 1903, pp. xxxviii, xxxix). (2) An example, labelled "Uganda," at Witley. Its history is, unfortunately, unknown.

THE "FRUIT-FLY" *DROSOPHILA* AND THE INHERITANCE OF SMALL VARIATIONS.—Prof. POULTON said that Prof. H. S. Jennings of Baltimore, U.S.A., who had kindly sent a set of his papers to the Entomological Society, had remarked in an accompanying letter, Jan. 16, 1918: "We feel that we have here in America, in Morgan's *Drosophila*, a sort of machine for grinding out answers to all sorts of questions in genetics, and now that that question of the inheritance of small variations has been put to it, it yields an emphatic affirmative answer."

MUSCA AUTUMNALIS, DE G. (CORVINA, F.), HIBERNATING IN A LOFT IN THE ISLE OF WIGHT. Prof. POULTON exhibited examples of 66 males and 80 females of *Musca autumnalis* captured Dec. 14, 1917, in the cistern-loft of St. Helen's Cottage, St. Helens, Isle of Wight. The loft had not been examined in the winter since Jan. 4, 1915, when far greater numbers of the flies were present, as described in Proc. Ent. Soc., 1915, p. xxi. The 146 flies were obtained by sweeping with the hand into a tin box the individuals of two long narrow patches on the close boarding of the roof, each stretching, as in 1915, along the angle made by a rafter with the roof. By sweeping in this way probably $\frac{2}{3}$ of the sluggish flies were secured. In addition to the 146 *M. autumnalis*

a single example of *Pollenia rudis*, F., was swept into the box.

The cisterns had been kept quite free from flies by covering loosely with boards on which layers of newspaper were spread. A large scattered patch of flies was found between two of the sheets. It was probable that the loft had been similarly occupied in the winter of 1916. The repeated choice seemed rather singular, for the loft was formed within the four steeply pitched, slated sides of the roof of a small tower, exposed to the weather and enclosing probably the coldest part of the roof-space.

HYPOLIMNAS (EURALIA) DUBIA, BEAUV., FORM WAHLBERGI, WALLGR., AT REST IN THE SAME SPOT AFTER A WEEK'S INTERVAL.—Prof. POULTON read an extract from a letter written by Mr. W. A. Lamborn, Nov. 5, 1917, from Tanga, East Africa. It would be remembered that Mr. Lamborn had made similar observations on species of *Lycenidae* in S. Nigeria (Proc. Ent. Soc., 1912, p. xxxiii; 1913, p. xxi). "I noticed one Sunday a *wahlbergi* female, with wings injured in a particular manner, at rest under a mango, and on going to the same spot a week later I found it still there. This caused me to hunt for a possible food-plant, and I found two little nettles of sorts in a fork of the tree. I brought one back with the butterfly, but I handled it so clumsily, thinking at the time of something else, that it escaped, but I feel sure that this must be the East Coast food-plant, and probably that of *E. usambara*, Ward, I expect, so that I feel I made one little advance on that particular Sunday. I think *usambara* the most imposing of them all, and I should so like to do a little work on it."

EPITOLA URANIA, KIRBY, ? = POSTHUMUS, F.—Prof. POULTON said that he owed to Mr. J. J. Joicey the opportunity of exhibiting the type of the West African *E. urania* from the collection of the late Mr. H. Grose-Smith, and of comparing it with the series of *posthumus* in the British Museum. It seemed a pity that there should be any uncertainty as to the specific status of one of the most magnificent *Lycenids* in the world, and that Prof. Aurivillius should be obliged to speak of *urania* in the words at the head of this paragraph

(" Rhop. Aeth.," p. 292). Some of the specimens in the British Museum were undoubtedly conspecific with the type exhibited to the meeting, but it would be necessary to obtain anatomical data before deciding that the whole series labelled *pushamang* was made up of the variable individuals of but a single species.

Since the above paragraph was written the question has been settled. In a considerable series of specimens like that of the British Museum two groups may be distinguished, especially recognisable by the differences on the hind-wing under surface.

Group 1, including the majority of the specimens. The hind-wing under surface has a golden iridescent ground-colour, and is traversed by long white nervular and internervular streaks, the latter like spear-heads in the areas round the end of the cell. These markings usually extend from areas 2 to 7 and are sometimes also seen (of linear form) in 1a, 1b, and 1c. In some individuals they are yellowish and in some, probably worn, they cannot be traced.

Group 2. In this, the smaller group, the iridescent ground-colour is richer and darker in tint, often deep purplish in certain lights. The white markings are represented only by the spear-heads and nervular streaks of areas 2, 3, and 4, or some of them. These reduced pale markings are far more conspicuous against the dark ground than the more numerous and fully developed markings of Group 1. The line of the median in most specimens of Group 2 marks sharply the edge of a dark streak dividing the hind-wing under surface into two sections. In the darker specimens this streak is deep blue in certain lights; in the less dark it is purplish. This character is especially strongly marked in the males, occasionally evanescent in the females. On the upper surface the males are also distinguished by a greater development of black at the apex of the fore-wing and in the hind by a broader black margin increasing in breadth towards the apex: the females commonly possess a series of very variable blue spots extending from the mid costa towards the centre of the outer margin.

The male type of *clion*, Doubl. and Hew., from Ashanti, and

the female type of *belli*, Hew., from Cape Coast Castle, belong to the first of these groups; the male type of *urania*, Kirby, from Cameroons, is a typical example of the second. The type of Fabricius' *posthumus* is unfortunately lost, but the description is clearly that of a female. Furthermore, Fabricius refers to "Jones' Icones" (5, tab. 77, fig. 2), of which copies by Donovan and Westwood exist in the Hope Department. These copies (fig. 2 includes both upper and under surface, etc.) represent a female of the first group—apparently a rather worn specimen showing no trace of the white radiate markings on the hind-wing under surface. Some slight confirmation is afforded by the fact that the early West Coast material was mostly from Sierra Leone, where members of the first group are common and those of the second rare. Taking the whole of the evidence together there can be no doubt that Aurivillius was right in sinking both *clion* and *belli* to *posthumus*.

If, then, the two groups described above represent two species, *urania* stands as distinct from *posthumus*. Considering the great variability of both groups and the occurrence together, especially in the southern part of the range, of individuals from both of them, the differences in pattern are insufficient to determine the question. I therefore sought the help of Dr. T. A. Chapman, who kindly consented to examine the male genitalia of (1) a typical example of the first group (*posthumus*) from Old Calabar; (2) a specimen of the second group, also from Old Calabar, closely resembling the type of *urania*; (3) another example of the second group collected by Mr. S. A. Neave in the Mjanga Forest, Toro, Uganda. Dr. Chapman reported that (1) was quite distinct from (2) and (3): "The *Epitolas* are very distinct; the most obvious differences are in the *aedraegus*, with a remarkable serrated projection on the ventral side in *posthumus*, very straight and smooth on this aspect in *urania*; the dorsal projections much longer in *urania* (folded in mounting in both specimens). The falcis also differ very decidedly: the claspis also differ, etc."

The differences of pattern here described are recognised in the arrangement of the British Museum series, but apparently

no attempt was made to determine the position of *urania*, both groups being arranged under *posthumus*.

In the British Museum, examples of Group 1 (*posthumus*) are included from Sierra Leone, Cape Coast Castle, Gold Coast, Ashanti, Kumasi, Accra, Calabar, Old Calabar; examples of Group 2 (*urania*) from Sierra Leone, Old Calabar, Cameroon, and W. Uganda. In the Hope Department, 4 males from Oni, 70 miles E. of Lagos (W. A. Lamborn), and 1 from Old Calabar are *posthumus*; 1 male labelled "trop. Africa" is *urania*.

Both species occur together on the West Coast, but *posthumus* predominates to the N. and *urania* to the S. So far as at present known *urania* is the only species in W. Uganda, this locality being represented by one male and three females collected by Mr. Neave. Of these, the male (Mpanga Forest, Toro) exhibits an increase in the black parts of the upper surface pattern as compared with W. Coast specimens, while all three females (Buamba Forest, Semliki Valley) possess the above-mentioned series of blue spots on the fore-wing upper surface.

It has not been deemed necessary to repeat the full references to the literature given by Aurivillius in "Rhop. Aeth.", p. 291-2.

THE HABITS OF ETHIOPIAN SPECIES OF SARANGESA AND OTHER HESPERIDAE. Prof. POULTON read extracts on the above subject from a letter written by the Rev. K. St. Aubyn Rogers from Kongwa, in ex-German East Africa, near the Central Railway and due W. of Zanzibar:—

"Nov. 22, 1917.

"I have been intending to give you my experiences of the habits of the genus *Sarangesa* for some time. They are certainly not exclusively nocturnal, as they fly and visit flowers quite freely at all hours of the day at all seasons even up to dusk. I rather fancy the peculiar habit of resting during the day in dark places is characteristic, perhaps exclusively, of places with a marked dry season and only in that season. I remember at Taveta noticing *S. eliminata*, Holl., in numbers down a well shaft, and here I have observed a more variegated

species ? *S. plistonius*, Plötz (it is not *S. matozi*, Wallengr.), in some numbers under the verandah at Kivukwe. This house has a thatched roof and the verandah is very dark. I have also seen the dry form of *Precis sesamius*, Trim., resting there. At the same time I have found this last species quite freely at flowers at all times of the day, even the hottest hours.

"I fancy the habit of resting on rocks, and by no means exclusively dark rocks, is even more universal in *Sarangesa* at all seasons. I have little doubt that there are nocturnal Hesperidae, e. g. *Coenides cylinda*, Hew., and more particularly *Ploetzia cerymna*, Hew., which only appear at the same time as the Hawk-moths come to light (see my note in Ent. Mon. Mag., June 1913, p. 130). All the species of *Rhopala-campa* fly at least up till dark, though they are also on the wing by day. I am inclined to the opinion that all this group are more truly nocturnal than *Sarangesa*, though I should agree that this last has to some extent adopted nocturnal habits in extended dry seasons.

"It looks as if the rains were near, but we have had nothing more than quite light showers here yet, not enough to make any difference. I have been up to Kiboriani this week, and saw several much-worn dry-season forms of *Precis sesamius*, and *P. antilope*, Feisth., and one or two *P. artaxia*, Hew., but have not seen a single wet form of this genus yet."

Prof. Poulton said that a similar observation on *P. cerymna* had also been made by Capt. G. D. H. Carpenter, who had captured the insect coming to light at 9 p.m., although there was evidence that the species was by no means exclusively nocturnal or even crepuscular (Proc. Ent. Soc. Lond., 1915, pp. xlv, xlv).

THE CONSPICUOUS CATOCHALINE MOTH *Egyholis vaillantina*, Stoll, seized and dropped by a bird, at DURBAN. Prof. POULTON said that Mr. C. N. Barker had sent to him the following observation recorded by Mr. Harold Millar, who had written, Nov. 27, 1917, from the Zoological Gardens, Mitchell Park, Durban :—

"I was in scrub bush yesterday, sitting quietly watching a 'Noisy Bush-Chat' [*Cossypha bicolor*, Sparrm.], when another of same kind came along, perched itself about 12 in.

off the other and started chatting at a great pace; then there came flying along loosely a common old 'pearl-onah' [*Egyholis caillantiua*], which eventually floated towards the 'Chat,' which, perched as it was, suddenly seized it, crushed and killed it, and then quietly let it drop to the ground as though saying, 'What do you mean by disturbing me while at song?' I was not more than 10 feet away and could see all that took place. Quite interesting and instructive."

In the accompanying letter, dated Nov. 28, from the Durban Museum, Mr. Barker spoke of the extraordinarily wet season of 1917. It would be interesting to know whether the butterflies exhibit any marked effects:-

"The weather still remains persistently wet: one only gets a few hours' glimpses of the sun at rare intervals, and this condition has been continuing since the middle of June, previous to which we had almost a decade of droughty year. In all my 41 years' experience of S. Africa I have never met with conditions even approaching those of this year."

[In a later letter dated Feb. 20, 1918, Mr. Barker writes: "We have had nearly 80 inches of rain within the last 7½ months, and I have been hoping to come across something abnormal in the melanic line. The black bordering of white Pierines is extremely developed almost throughout, but I have met with nothing quite abnormal so far. Insects, except the hardy common forms, are also unusually scarce, probably due to the lack of warmth caused by these extraordinary rains. *Papilio dardanus*, *hippocoon* and *trophusius* ♀ forms up till just now appear to have been quite as numerous as *cenea*. Last Sunday, however, I observed 4 *cenea* and not a single example of the other forms. The males are especially plentiful this season."]

[These remarkable rains were also prevalent much further north, for Mr. C. F. M. Swynnerton wrote, Feb. 2, 1918, from Chirinda in S.E. Rhodesia: "A wonderful season here. We have had some very wet ones before, but this beats them all. We have had rain practically daily since about the 1th of November: over 45 inches in January, and February threatening to beat it. The effect of such a season on insect life should be interesting to note. It must *indirectly* have been

favourable, as there is bound to have been a great mortality among young birds. Two young owls, full-fledged and feeding for themselves, that frequented my coffee plantation were both found dead, emaciated and with empty stomachs. *Probably* it must have been very unfavourable to butterflies at any rate: it will be interesting to note the numbers in which they appear later."]]

THE *SESIA* MIMICS AND NOT MODELS OF THE HYMENOPTERA.

—Prof. POULTON said that he wished to draw attention to an unfortunate misconception in the recently issued part of M. Charles Oberthür's beautiful work, "*Études de Lépidoptérologie comparée*," Fasc. xiv, 1917. On p. 131 M. Oberthür makes the following statement in a passage kindly translated by Mr. E. A. Elliott :—

"All insect hunters have testified (constaté) that the *Sesia* are imitated by a considerable number of insects of various Orders, especially Hymenoptera and Diptera, but also Orthoptera. These insects, mimicking the external appearance of the *Sesia*, live at the same time and in the same places as they do. When searching at Monterfil for that same *Sesia aeneiformis* which I have already mentioned several times, I have been entirely deceived by the flies and even by grasshoppers which, when among the clumps of furze, present an appearance analogous to that of the Lepidoptera. I fancied first that I saw a *Sesia*, but was never long before I detected the deception caused by this mimicry."

Prof. Poulton said that it was important to correct this statement as promptly as possible. So far from the view expressed above being the generally received one, it was the first time he had heard of it, and it was contradicted by all the names ending in *-formis* which were so plentiful in the group. It was unnecessary to refer to the number of memoirs in which the *Sesia* were spoken of as mimics of the Hymenoptera.

HARPAGOMYIA AND OTHER DIPTERA FED BY CREMASTOGASTER ANTS IN S. NIGERIA.—Prof. POULTON said that he had just received a letter from Mr. C. O. Farquharson, dated Dec. 13, 1917, from Ibadan, describing this most remarkable association in an entirely new part of the world. Mr. Donis-

thorpe had kindly informed him that, so far as he was aware, the only published record was that of Edward Jacobson, who observed *Harpagomyia splendens*, Meij., fed by the ant *Cremastogaster difformis*, Smith, in his garden at Batavia—Tijd. v. Entom. 52, 158-74 (1909); Notes from the Leyden Museum, 31, 246 (1909) and subsequently at Samarang, Central Java—Tijd. v. Entom. 54, 158-61 (1911), 3 Plates. Jacobson figured the larva and pupa and reproduced photographs of the gnat being fed by the ant.

It was to be hoped that specimens would soon arrive so that the Nigerian species of *Cremastogaster*, as well as the other Diptera which Mr. Farquharson observed being fed by them, might be studied and if possible determined.

"Many things remain incomplete, but I can honestly tell you that I have never described what I was not certain that I actually did see. At times, indeed, I have seen such curious things that I was afraid to describe them on one observation in case I were wrong, for I could scarcely credit the evidence of my own senses. On one occasion, for example, I was certain that I actually saw a mosquito (at Agege) obtain regurgitated food from a *Cremastogaster*. I am sure it was a *Stegomyia*. . . .

"I've just come back from my evening stroll. I went down to our old haunt (Lamborn's and mine) to look into the welfare of two Lycaenid larvae that have, for the last few days, been slowly devouring a happy family of Corcidae (? *Lecanium*) on a young plant of *Imbricaria marima*. Of them more anon. Having still a little daylight to spare I went to the old 'Howlsonia tree,' and there saw at least half a dozen mosquitoes hovering over the *Cremastogaster* 'campus.' There was light enough clearly to see three of them at the same game—not *Stegomyias* and not *Anophelines*. I had no tubes to collect them; I was tired when I went out and didn't expect to get the length of the old tree, but I know now that I'll see them again. But I wish I'd been in time for the mail. I took the *Stegomyia* at Agege in a tube which I failed to notice at the time to be moist. When next I looked at it I found it dead and sticking to the wall of the tube. I had a reaction, doubted my eyesight, left the tube

lying about, and saw the mosquito next floating in the alcohol between those *Catochrysops* pupae. These I had accidentally put into the same tube a day or two later, and the observation must have been made about that time."

Dec. 19, 1917.—"I had to go to Agege to pay the labour there: on Friday, Dec. 14, the day before I left for there. I thought I'd like to go down to the famous *Crematopisther-Heilsania-Argiolaus* tree (I forgot *Iridopsis*) just to have another look at the mosquitoes, to make sure that they really were there. I captured two, easily enough, in little glass tubes, one with its precise ant and the other not. The precise ant, finding itself imprisoned and annoyed, attacked the unfortunate mosquito and killed it. (In a confined space they will kill the softer Lycaenid larvae.) Hence I had to forego the precise ant in the case of the other. On the tree I could make out what looked like white banding on the mosquito, and went home to look more leisurely at my find. Landed there, I got a bad attack of what is known as 'cold feet.' I knew little or nothing about mosquitoes, but had vague recollections of a picture in a wonderful official compilation known as the 'West African Pocket Book,' that of a *Stegomyia*, described in the accompanying letterpress as exhibiting the pattern of a football jersey. (No wonder the unfortunate animal is a victim of yellow fever!). But somehow the proboscis of my myrmecophile didn't seem to fit into the scheme of things. Its proboscis wouldn't, anyhow. It produced the local 'chill,' for I couldn't recall any mosquito like it. I began to wonder if it could really be a mosquito after all, but its 'poise' when alive, with its hind legs *en l'air*, and everything else appeared to be unimpeachable. None the less I decided that I couldn't wait till I heard from England, so I decided to take it down to my friend Mrs. Connal at Yabe when I went to Agege. This I did. I sent it down a day ahead of myself with solemn injunctions not to treat the matter with levity, it being no common mosquito, being in fact a myrmecophile. When I reached Yabe I found that there is next to nothing new under the sun! I'm quite sure now that what I'll get back from Lamborn will be a callous recommendation to go to his old office library cupboard, find

therein a work of somewhat forbidding exterior described as 'A Monograph of the Culicidae of the World,' by F. V. Theobald (vol. v), in which, on pp. 547 *et seqq.*, I shall find out all about it. Mrs. Connal assures me that it is at least a new *Nigerian* record. She had never met a *Harpagomyia* before—it is *H. trichorostris*, Theobald—but there can be no doubt that that is the correct identity of my find. And there, on p. 548, it is set down without comment, 'They are myrmecophilous insects'! If the British Museum hadn't bound that work in such a cover, I'd probably have found it out for myself. I am ashamed to confess that I had never even looked inside it. The book, of course, is devoted to melancholy facts of existence out here, which is one reason why I didn't care to look into it, but really publishers ought to exhibit a little more psychological insight. It really is a pity that it has not as worthy a cover as, for instance, 'Wheeler on Ants.' I am puzzled about the name *Harpagomyia*, which I take to be derived from *ἁρπάγω*, to seize, and *μύα*, a fly. The name suggests a synecthran rather than a symphile. From my observations I should class it as a symphile rather than a synecthran. Wheeler's bibliography makes no reference to Meijere, but the latter's description of the genus would, I imagine, have just about synchronised with Wheeler's publication. At the worst it is a mild *ἔχθρα*, in the form of highway robbery without violence, if not indeed mere alms solicitation by a sturdy beggar."

Dec. 23, 1917.—"I reached the tree just after ten: I had seen an *Iridopsis* larva yesterday which I thought I might safely leave for a day or two, and went along to see that it was all right. I hope it is, for I regret to say I couldn't find it again. I may, however, find the pupa on further search. I saw quite half a dozen *Argioleus* pupae (the 'gall' species). I saw their larvae coming down a day or two ago. One I found to be parasitised by a *Cordyceps*, only the conidial (*Isaria*) stage being present. I next examined a half-calabash of water that I had placed in a hollow of the tree to see whether any mosquitoes had oviposited—I am in hopes of inducing *Harpagomyia* to do so. I failed to get one in the house. I found a number of 'rafts,' but I don't think they

are those of *Harpagomyia*. I am in hopes, too, that I may get ova of a very large mosquito, I think a *Toxorhynchites*, at the same time, for I frequently see them near the tree. They do not bite man, and I am wondering whether they have anything to do with ants. I then had a look at some Lycaenids (Epitolas, I think) feasting on Coccid secretions on a shrub hard by the ant tree, the Coccids being *Cremastogaster* attended. I noticed a few small Dipterous flies apparently trying to get a share of the Coccid good things, but just then decided that they didn't look very interesting. Hard by the ant tree are one or two *Funtumias* (native rubber--*Apocynaceae*), on the stems of which the ants also run about, and on which I captured on previous evenings some of the *Harpagomyia*, 'in flagrante delicto.' I thought I'd have a look at that too, and to my surprise found quite a number of the mosquitoes as busy as could be. I think more of them than I have seen at dusk. I didn't leave the neighbourhood till a little after noon, and they were still there. The place is moderately shady, but by no means 'forest' shade. I was there again at three this afternoon, and they were still busy. They are unquestionably day fliers [also observed by Jacobson] like *Stegomyia*, curiously enough. But for the time they became of secondary interest. For almost the first thing I saw was a small fly [2 species of *Milichia*] apparently 'chivving' an unwilling ant in a very daring manner. The ant stopped, apparently in despair of shaking off the importunate Dipteran. Immediately there occurred the usual osculation which signifies that one ant is about to offer, or at any rate part with, a drop of regurgitated food to another, but in this case to the fly. At first I thought the fly might be predaceous and was about to attack the ant much as a *Buzalia* attacks the Driver pupa. When a *Harpagomyia* solicits food of the ant it stands directly in front, but this fly, having induced the ant to stop, or rather in order to induce it to stop, comes up from the side, and the ant, if willing to oblige, turns its head half round. The flies--for I saw quite a number of them at it frequently, having got a little at one side, rush round to the other before the ant has time to move away, and get a little more. They are

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astonishingly active and expert at getting out of the way of ants that come up behind them. They rarely settled outside the track of the ants. I concluded that one or two that I saw in that position were, for the time, replete. When I brought a little glass tube up to them—to within a quarter of an inch, and not with any great caution either—they flew an inch or so over the stem of the tree, and if their flight took them once more amongst the ants, they simply, as it were, ‘watched points,’ taking care not to let an ant get them from behind, but making no attempt to importune them as they passed. I saw several, presumably hungry, flies alight right in the ‘busiest’ part of the track and immediately begin ‘chivving’ the ants—that is really as good a descriptive term as I can find. An ant coming up to meet a fly would dodge to the side. The fly immediately turned round and ran after it. Their actions were extraordinarily like those of the importunate beggar. If the ant took no notice, further than to keep on dodging out of the way, the fly didn’t waste much time, but turned round and importuned another. Those that refused to be ‘bled’ or ‘touched’ seemed to show no serious resentment and made no attempt to drive off the beggar by force. Cremastogasters running up and down a tree are constantly making little regurgitory exchanges, a momentary ‘osculation,’ and each hurries on its way. If anything the fly and ant exchange lasted rather longer, but the ant continued on its usual hurried way just as if it had met one of its own kind. It is just the same when *Harpagomyia* is the other party in the transaction. *Harpagomyia* however, hovers an inch or less over the line of ants (at times resting on the stem and dodging out of the way when necessary), till it sees what is presumably a likely ant. If the ant is running downwards the mosquito drops down (in flight) also, keeping a little in front of the ant—as near as possible without touching it. The ant tries to evade it, but the mosquito as a rule declines to be put off, and the ant at last stops. The mosquito quickly settles and the usual rapid exchange begins, the mosquito thrusting out its proboscis—which when not in action is carried bent under the body much like the rostrum of a Reduviid bug—so that the swollen

end is practically within the ant's jaws. I have seen the ant's palpi (*not* the antennae) vibrating on it. The swollen portion of the proboscis is undoubtedly capable of independent movement. I may say that the mosquito is not 'nervous,' and I have had no difficulty in several cases in standing with my eyes sufficiently close to the two insects to make out the ant palpi and the proboscis movement in the mosquito. The ant raises its head slightly when the exchange takes place."

Dec. 27, 1917.—"On Xmas Day also I made another quaint observation. I have been looking about for other Dipterous myrmecophiles. In my search I came on a large crowd of *Cremastogaster* sp. on the trunk of a Saman tree (*Enterolobium samau*)—an introduced shade tree. I thought from the appearance of them that they were about to start up a new nest. All were workers, but I think they came from another large nest not far away. On closer examination I was astonished to see that there were a large number of dead ones sticking to the rough bark of the tree in all sorts of attitudes, but looking as if they had died there and had not been carried up and afterwards 'dumped' by tired workers. Some were in fact still moribund. I soon noticed some curious little Diptera [*Rhynchopsilopa* sp., *Ephydriidae*] which I thought might be the same as those I had seen on the *Harpagomyia* hunt. They are, however, quite different. I soon became interested in their doings, for they settled among the ants, dodging about when a worker approached them, but refusing to go far away. I thought I had only to wait and see more able-bodied beggary. What I saw was something quite new. I saw it repeatedly, as often as I liked, and so tame were they that I could actually study their doings through my pocket lens. When they saw a dead ant, that had expired in such a position that its abdomen was easily accessible, they alighted on it. For such small flies they have a huge proboscis. This they thrust into the appropriate orifice and fed, not this time on stomadeal food, but on proctodeal. Pirouetting neatly on the abdomen of the dead ant, they were themselves—but for the wings, which when in rest stick up from the body at rather a high angle—not unlike ants. When in the act of ingesting the abdomen

was raised and lowered gently, and I could also make out the brilliant white halteres in motion upwards and downwards. When the abdomen was raised the halteres were depressed together. I really think their association with ants is not accidental. I got two or three pairs, and have been trying to induce the females to oviposit on stale fruit, but without success. I cannot account for the death of so many ants. Hundreds of a *Pheidole* were running about, in many cases carrying off dead *Cremastogasters*, with little or no molestation. I do not for a moment think the *Pheidoles*, numerous though they were, could have caused the slaughter. I am inclined to think the ants must have come from a 'boul' brood. I have put up a lot in spirit for examination, and am keeping the nest under observation. They are still in the same place, and the little flies are still busy in their curious and rather unpleasant way."

Dec. 29, 1917. "I have been laying traps for *Harpagomyia* ova in the form of bits of calabash with water placed in the hollow stem of the ant tree. I've got hosts of larvae of different sorts, but four have outstripped all the others - great red forms with white undersides which are predaceous on the others. I feel sure they are *Toxorhynchites*; I think the other larvae are *Stegomyia*."

Mr. DOXISTHORPE said it was of the greatest interest that Mr. Farquharson had observed in S. Nigeria the same extraordinary phenomena that Mr. Jacobson had first discovered and described in Java. He stated that the behaviour of the gnat as described by the two observers, although on the whole similar, differed slightly in some respects. Jacobson records that the Dipteron stood in the track of the ants, and that when an ant ran between its legs it supplicated for food, and was then fed as described by Farquharson. During the process the wings of the gnat were so rapidly vibrated that the nervures of the wings did not appear in photographs taken of them while feeding. Jacobson had discovered and figured the larva and pupa of the *Harpagomyia*. He says, however, that the eggs, which he does not figure, are laid in branches of trees which the *Cremastogaster* had deserted on account of their having been flooded by rain. The eggs may

also be laid elsewhere, inasmuch as the larvae appeared in the bowl of water in the glass case (containing the captive ants) into which he had introduced a number of goats. The larvae are easily recognised by their yellowish-white colour and by their habit of lying on the bottom of the vessel. Jacobson records that those nests of *Cremastogaster* which were most freely attended by the *Harpagomyia* consisted almost entirely of the small type of workers, and he considered that this was brought about by the amount of food taken from the ants, and therefore diverted from their larvae. He furthermore states that he had never found females, but only males and workers, in such nests. Mr. Donisthorpe said that this observation was of special interest to himself, as he had been working for some years on the causes by which females are produced in ants' nests. He had, for three years running, bred winged females from eggs laid in captivity by a community he had kept in an observation nest for over seven years, and for the first time last year in another community he had observed during five years, and he was of opinion that these positive results had been brought about by the amount of food with which these two nests had been supplied. Ants have been kept in captivity by very many myrmecologists for over 100 years, and in all that time winged females have only once before been produced from eggs laid in captivity, viz. when Lord Avebury bred five winged *fusca* females in an observation nest in 1880. The last-named observer also thought that his success might be accounted for by the fact that this community had been very well fed.

Some authorities also considered that the presence of pseudogynes in ants' nests was brought about by the ants taking too much interest in the beetle *Lomechusa* and its larvae, and in consequence neglecting their own brood. It will be of much importance if Mr. Farquharson should find that those nests of *Cremastogaster* which are most attended by the *Harpagomyia* in S. Nigeria are also unable to produce females.

Mr. Donisthorpe had also found flies of the genus *Milichia* associated with ants in this country, viz. *M. ludens*, Wahl., with *A. (D.) fuliginosus* at Darent Wood in 1909, and again

at Oxshott. It was always so scarce that there was no chance of watching its habits.

Mr. F. MUIR said that he first saw *H. splendens* at Mr. Jacobson's house in Batavia at the time when he was making observations on them. His published figures and photographs of them and his description of their habits were very accurate. Mr. Muir afterwards saw them in the field in Buitenzorg and Paseroean (East Java), and in the latter part of 1915 discovered another species (still undescribed) in Taihoku in N. Formosa. Charles Banks had described similar habits in a mosquito in the Philippines.

[Since the meeting of Feb. 6, Prof. Poulton had received an answer from Mr. Farquharson to some of the questions suggested by Mr. Donisthorpe :—

Mar. 22, 1918.—“ You wish to know whether the associated ant-nests produce winged forms. They do. There's no doubt of that whatever. I should say that it is entirely unlikely that the *Harpagomyias* should have any effect at all, for their numbers are relatively very few. I may say that of five *Crematogaster* nests known to me, I mean intimately, that I visit regularly, all are frequented by the mosquitoes, but one doesn't see more than half a dozen at a time. Besides, the ants, if not omnivorous, are certainly at times carnivorous, and at other times—regularly almost—frequent the glands of plants, collecting nectar all day long, in addition to ‘farming’ *Coccidae* of different kinds. I doubt if even the largest colonies, which must contain enormous numbers of inhabitants, ever experience anything like famine conditions or even moderate scarcity of food. I should think there would always be enough and to spare. You know how worker ants stop each other and exchange a little regurgitated food, a momentary transaction almost, both passing quickly on their way. The mosquitoes do exactly the same. They will drop downwards just over an ant that is hastening along in the usual way. The ant may stop and give an alms to the beggar, passing on a moment or two later as if it had just met a friend, and the mosquito flies up and down again till another obliging ant is met. At times the selected ant simply ignores the mendicant, but shows no resentment, nor does the mos-

quite press his or her attentions. (By the way, I haven't verified whether the habit is confined to either sex or not. I must look into that.) I had Dr. and Mrs. Connal here on a visit not long ago, and was able to demonstrate them at the top of their form. I also had the pleasure of showing them at work to Mr. H. N. Thompson (the Chief Conservator of Forests), a useful array of witnesses for any doubters to tackle. I was also able to demonstrate the other Diptera."]

Wednesday, March 6th, 1918.

Dr. C. J. GAHAN, M.A., D.Sc., President, in the Chair.

Election of Fellows.

Col. WILFRID WM. OGHVY BEVERIDGE, R.A.M.C., C.B., D.S.O. (on active service), c/o J. H. Durrant, Esq., Natural History Museum, S. Kensington, S.W., and Messrs. PATRICK AUBREY HUGH SMITH, Seconner House, St. German's, Cornwall, and 28, Bruton Street, Berkeley Square, W., and LIONEL JULIAN WALFORD, The Cavalry Club, Piccadilly, W., were elected Fellows of the Society.

Exhibitions.

MYMECOPHILE DIPTERA COLLECTED AND THE CULICID TOXORHYNCHITES BRED BY Mr. C. O. FARQUHARSON IN S. NIGERIA.—Prof. POULTON exhibited the specimens referred to in Mr. Farquharson's notes communicated to the last meeting of the Society (p. xxix), and received at a later date. The accompanying letter, written Jan. 26, 1918, contained the following paragraph: "I've sent two little sets of the 'ant-dies' and some Harpagomyias, besides the huge *Toxorhynchites* with a larva of the species. The larva is red dorsally and white ventrally like a tiny fish. They are predaceous as larvae on things like *Stegomyias* and even *Psychodid* larvae. As imagoes they don't bite, but are said to be anthophilous.

I've had no luck in getting *Harpagomyia* bred, except that the *Toxorhynchites* oviposited in my calabashes."

The specimens exhibited included 2 ♂ and 2 ♀ *Toxorhynchites brevipalpis*, Theo., with their pupa-cases, 3 ♂ and 3 ♀ *Harpagomyia trichorostris*, Theo., one of the males being specially associated with a ♀ ant—*Cremastogaster buchneri*, Forel, near the r. *alligatoris*, Forel. The two *Culicidae* had kindly been compared with the types by Dr. G. A. K. Marshall, the ant with specimens named by Forel by Mr. A. H. Hamm. The "ant-flies," also exhibited, had been kindly examined by Capt. J. E. Collin, who found that the "mendicants" were represented by two distinct species of *Milichia*, while the "proctodeal feeder" was a new species of the genus *Rhyachopsilopa*, Hendel (*Ephydriidae*). The type species was from Formosa. It was of much interest that the males and females of *Harpagomyia* appear equally to solicit the ants for food. Jacobson mentioned the males and females occurring together in Java, but did not record this fact.

THE NIDIFICATION OF *OSMIA AURULENTA*, PANZ.: A CORRECTION. Prof. POULTON said that he had recently received a letter from Dr. G. Arnold, in Bulawayo, correcting the statement, on p. xxxiii of the Proc. Ent. Soc. for 1916, that he had bred *Osmia aurulenta* from whelk shells, on the Wallasey sand-hills. The shells were a species of *Helix*, probably *memoralis*.

CAPT. W. A. LAMBORN'S JOURNEYS WITH THE EAST AFRICAN VETERINARY CORPS IN 1916.—Prof. POULTON said that he felt sure that Capt. Lamborn's letters, written from the localities at which he took the butterflies mentioned in Dr. H. Eltringham's paper in our Transactions for last year (p. 322), would be of interest, not only in relation to the insects but also because of the brief descriptions of a part of late German East Africa:—

"c/o Veterinary Department,
"Nairobi, British East Africa.

"12. 4. 16.

"I left Nyasaland in late January and only reached Mombasa in the last week of March, having had to wait a considerable time both at Beira and at Chinde for steamers. It

has been a most grievous waste of time, for at neither place was any economic work possible, the country round being swampy and uncultivated, and being in daily expectation of a steamer's arrival I was unable to go farther afield. However, I took a few butterflies at each place, just the ordinary common varieties. I have had no letters except three for the past five months and so am feeling quite out of touch with every one.

"There is still further delay here in regard to my commencing work. The Army Council wrote out that I am not to have a Commission and so I joined the forces, the only civilian among thousands. The position was absolutely untenable, and my experiences unenviable, and I am now in Nairobi while the Colonel of the Vet. Section, to which I am to be attached, is endeavouring to adjust matters. The Govt. Entomologist was given a Commission at the start.

"The work required appears to be simply to map out fly areas in German East Africa as the country gradually falls into our hands. Research work will probably be entirely out of the question, but I shall do my best to continue along the lines I followed in Nyasaland.

"The general opinion seems to be that the campaign here will only last a few more months, and it is said that the native troops on which the Germans are so much relying are already disorganised and out of hand."

"*New Moshi* [37° 24' E., 3° 24' S.].

"7. 5. 16.

"A wet Sunday morning gives me an opportunity of writing you a line. I have been attached to the East African Veterinary Corps with rank as Captain, and have now made a definite start on my duties by surveying for tsetse a horse camp in the vicinity of this place.

"I am now about to trek away towards the west along the foot-hills of Kilimanjaro, searching for the flies along the road. It is by no means pleasant just now because there is a constant drizzle of rain, and there is an appalling amount of liquid mud.

"I have made already a small collection of Lepidoptera on the mountain slopes, but, as you will understand, one cannot

put much heart into such work in these anxious and trying times.

"*Acraea encedon* is fairly plentiful and I got one large *lycia* form, a splendid specimen, which I did not recognise as such on the wing, and there are various species new to me but which are doubtless common enough.

"It is perhaps early days to express an opinion, but I am by no means sure that my services are going to be of any real value to the military authorities. However, I shall of course see the matter through, hoping to justify my transfer here by the discovery of the breeding-grounds of the local tsetse, *Glossina pallidipes* and *longipennis*, pupae of which have been urgently needed for a long time for trypanosome work in the laboratories.

"Carpenter has just written me his usual cheery form of letter from the S.W. corner of Uganda."

[Uganda, 35° 50' E., 4° 16' S.]

"3. 6. 16.

"Most of my days are spent in steadily trekking along military paths in search of tsetse, and I have now covered so much ground that I am no great way behind the sphere of operations. I have defined several large fly areas, but beyond that have not been able to do a great amount of entomological work. However, I try to add a few insects daily to a collection, and am not forgetting Lepidoptera, *Acraeinae* in especial, which seemed to me to be probably of most interest.

"The country as a whole where I have been was arid in the extreme, lack of water being a serious trouble at times, but every now and again there has been a good river with insects fairly numerous in the vicinity.

"I have been much struck by the abundance of *dorippis*, the type form being almost absent. *Inaria* also seems to be more numerous than the type, and *encedon* is almost invariably a brown form [*daira*] without any sub-apical bar at all. I have twice met *dardanus* ♀s. The first settled with outspread wings on a flower, and I said to myself at once, 'What a huge *psittalea*,' and until I had it in the net I did not realise it was a *Papilio*. It had a white pattern on a black background just like the *Amauris*, but unfortunately the specimen

will not be forthcoming. I put it alive under my helmet while considering the feasibility of trying to breed from it, and in the meantime it escaped. The second female—I forget the name of the form, but do not think it is quite *trophius*—has light sulphur subapical markings and light brick-red on the hind [or inner] margin of fore-wing and centre of hind-wing, with black margin [the new form *lamborni* described in Trans. Ent. Soc., 1917, p. 335].

"I trust that when this letter reaches you the news will have got through to you that the campaign is over.

"Some of the ♀ tsetses here have a puncture or cicatrix in the centre of the abdomen, the causation of which I am hoping to be able to investigate. It will be almost out of the question when the war here is over, the country being very thinly populated indeed, and so inhospitable in the regions where I have been.

"I am longing to be able to have a good butterfly talk with you and to see the recent additions—all by other people this time—in your department. I have only some ten months to do to the end of my tour."

"The Front, German East Africa,
[Ufomi was the last halt before reaching the Front].
" 15. 6. 16.

"I reached some days ago the scene of actual warfare, and am now held up indefinitely behind the trenches until such time as a move takes place. Apart from the excitement produced by the German shelling—they put fifty-three shells about two miles behind my tent yesterday morning—life is very dull, for the district is so arid that insect life seems almost non-existent, and I have to try and console myself by perusing Sharp's 'Insects' and the last volume of Gibbon.

"Here no one seems to know at all what developments are likely to take place, though further back the people seem much better informed.

"At my last halt I found a well-watered fertile valley in which were a fair number of Lepidoptera, some of which I was able to collect. A species of *Anaëris* [*A. albinaculata*, Butl.] was quite common—I must have taken at least thirty—and with it a *Euralia* [*dubius mina*, Trim.]—a most perfect mimic

—of which I took three. I shall despatch all this material directly I get back to B.F.A. [Of the above *Amantia* model and *Hypolimnas* (*Eurafia*) mimic, Capt. Lamborn took, in the wooded river gorge at Ufioni, on June 4th, 15 models and 1 mimic; on June 5th, 6 and 0; on June 6th, 3 and 2, respectively.]

"I hear little news of the outer world, and have no mails, but hope all is going well elsewhere."

[*Handeni*, about 38° E. and 6° S., on 23. 7. 16.]

"24. 7. 16.

"I continue to trek mile after mile defining tsetse areas, but without, I am afraid, any benefit resulting thereby; and the only consolation I have is that I am carrying out such instructions as the military authorities have given, and can do no more.

"I have collected now a considerable number of insects, including long series of *Acræinae*. One or two look really interesting, but apart from them the butterflies are just the ordinary things.

"You probably hear more than I do as to the progress of this campaign. We seem, thanks to the energy of the South Africans, now to be making good headway, but I am no longer so hopeful as to a speedy conclusion to it.

"I have not been able to get any letters at all bearing this year's postmark, which is a great anxiety, as there must be many for me at Nairobi. My life is too nomadic for them ever to find me, and so, at my desire, they are not sent on. I long for a return to my own researches, as life seems so utterly empty these days.

"In about seven months my tour will be up, and if all is well by then, I should be thinking of returning."

DR. TH. MORTENSEN'S OBSERVATIONS ON THE "FALSE HEAD" OF LYCAENIDAE AND OTHER BUTTERFLIES, ETC.—Prof. POULTON drew attention to "Observations on Protective Adaptations and Habits, mainly in Marine Animals," published, in English, as one of the papers on Dr. Th. Mortensen's Pacific Expedition, 1914-16 (*Vidensk. Medd. fra Dansk naturhist. Foren.*, Bd. 69, pp. 57-96, Pl. I.) and especially the "Observations on Insects" (p. 83). The author.

Dr. Mortensen, had made no special study of mimicry and his "observations are made entirely independently, so to say unintentionally, without any preconceived ideas or wishes to find instances of mimicry, protective resemblance or the like." This detached attitude gave a special value to the conclusions on the extraordinary phenomenon of the "double" or "false head" in *Lycaenidae*, reached by the author during his residence in the island of Taboga, Panama, Nov. 1915-Feb. 1916. Here he observed on the hind-wings the antenna-like tails, the associated eye-spots, the alternate movements, the outward bent lobe of certain species giving "the most wonderful likeness to a real broad head," and, with all this, the inconspicuous real head and motionless real antennae. The Lycaenids observed at least a dozen species—were never seen to rest head downwards but always horizontally on leaves or flowers. The species figured were *Thecla acis*, Drury, *T. phaleros*, L., *T. battus*, Cram., *T. marsyas*, L., together with four unnamed species. The Nymphaline *gigaecia dirce*, L., also figured, was stated always to rest head downwards, usually on tree-trunks, and seeing it in its natural position "one cannot resist the impression that it is the head turned upwards, and that the meaning of it must be, that lizards are thereby induced to direct their attack at this non-vital part." Attention was also directed in this species as well as in certain Lycaenids such as *Thecla phaleros* and *T. battus* to the convergence of the lines of the under surface pattern towards the "false head" and the greater brightness of the colouring near it. Hence "the eye is involuntarily directed towards this spot. This is a curious analogy to the honey guides in flowers."

Although the author accepted the interpretation that enemies are thus "induced to attack this non-vital part, while the butterfly escapes with the loss only of a part of its wings, unessential for the flight," he never found a specimen "with the false head partially or completely bitten off"—perhaps a consequence, as he suggests, of the limited vertebrate fauna of so small an island; for precisely these injuries were known to be very common, and dozens of examples from all kinds of localities existed in the Hope Department.

After his return to Denmark the author failed to observe the movement of the hind-wings in *Thecla w-album*, Knoch, of which the false head was observed by Dr. R. C. L. Perkins in 1888 ("Colours of Animals," Poulton, 1890, p. 208). Prof. Poulton had observed that the movements, which Dr. Chapman had aptly compared to those of the eccentricities of an engine, only occurred under certain conditions—viz. the short rests, generally on flowers, between flights in hot sun. Dr. Perkins had kindly recalled the circumstances under which his observations were made thirty years ago :—

" Feb. 16, 1918.

" It would have been on hot sunny days that I saw the *T. w-album* moving the wings one over the other in the way described, as I used to go to the place to catch a particular Fossor on the same plant, which was a tall yellow-flowered Umbellifer—the species I forget. It has a strong scent and I have seen as many as half a dozen of the *w-album* on a single head. The month would be July (after summer term at Oxford). The place was a small quarry cut out in the middle of a thick wood and a very hot place, being an opening surrounded by trees, wych-elms, near Badminton, the seat of the Duke of Beaufort, and on his estate. I went past there a year or two ago after a lapse of about twenty-five years and found the wood cut down and I could not detect the quarry. I am sure I *often* saw the butterflies behave as reported, and occasionally I saw one attacked by wasps (*Vespa*), which frequented the same flower-heads. I have seen other British Lycaenids make the same movements, and also Lycaenids of most diverse kinds, in Mexico, Australia, etc. It must be a very general habit.

" The *T. w-album* used to sit very quietly for a long time together on one head of the flower, if not frightened. I used to find them elsewhere in Gloucestershire and Wilts in abundance on the common small-flowered pink thistle and on blackberry, but I cannot now remember whether I saw them move their wings in those places. My memory is most clear as to what I saw in that particular quarry near Badminton."

Dr. Chapman wrote Feb. 20 and 27 :—

"The 'eccentric' appearance is due to the margin of the opposite wing appearing and disappearing, much as one disc of a pair of eccentrics does behind the other. It is most remarkable as being the only case I can call to mind of the wings of opposite sides moving asymmetrically. Wings of opposite sides in other cases move in an identical manner."

"I certainly associate the movements with rest in a warm sun, but I don't think a flower is essential. After a short flight the butterfly settles for some seconds, hardly minutes, apparently really for a rest, not for basking, makes these movements whilst resting, and then goes off. The rest is a brief interval between flights, not a rest for the night or when the sun is obscured."

Although as a rule the eccentric movements were performed with the wings nearly or quite closed, Prof. Poulton felt sure he had seen them with the wings partially expanded so that the upper surface was distinctly visible, and he remembered Dr. Chapman suggesting, at a meeting of the Entomological Society many years ago, that these movements, when made by the males of some of our common species, perhaps promoted the resemblance to a blue flower slightly twisting and untwisting on its stalk in the breeze.

The question arose as to whether the movements now observed in tailless *Lycaenids* had persisted from some ancestral time when tails were present—a view adopted in "Colours of Animals," pp. 208, 209. Prof. Poulton still thought that this was the most probable interpretation in view of the prevalence of tails throughout the *Lycaeninae* of nearly all groups, and the fact that the associated variations in the nervous and muscular systems were in every way likely to persist longer than variations in colour and pattern, and in such structural features as the tails and lobes. If this view be correct the eccentric movements of the non-tailed *Lycaeninae* had some secondary meaning, probably directing attention to the conspicuous marginal pattern of the hind-wing under surface which is often strongly emphasised and often exhibits one or more eye-spots in the region of the tail even when the tail itself is wanting; when the wings are open perhaps having the meaning tentatively suggested by Dr. Chapman.

And in the tailed forms secondary meanings appear to have developed in genera such as *Argiolaus*, *Oxyliodes*, etc., in which these appendages are too large and conspicuous to resemble antennae. Mr. S. A. Neave had informed Prof. Poulton that the African Lycaenid in which he had been most struck by the eccentric movements was *Oxyliodes faunus*, Drury, f. *albata*, Auriv.—one of the species in which the appearance of a "false head" seems to have been to a large extent lost in the promotion of excessive conspicuousness in the same region of the hind-wing. It was interesting to note that the underside pattern was such as to direct attention to the exaggerated tails and eye-spots of *Oxyliodes* and many of its allies, no less than to the far more perfect "false head" of other species.

It would be of extreme interest to observe whether the eccentric movements were ever made by the *Lipteninae*, or indeed by any Lycaenid outside the *Lycaeninae* (in the broad sense, as employed by Aurivillius) and *Theclinae* (also in the broad sense and including all kinds of "hair streaks"). Prof. Poulton was inclined to believe that such movements are not made outside these two groups and that other Lycaenids were originally tailless. Mr. G. T. Bethune-Baker had kindly drawn his attention to the fact that, although the *Lipteninae* were always without tails, the end of vein 3 was distinctly notched in *Epitola miranda*, Staud. Mr. Bethune-Baker differed from Prof. Aurivillius in separating from the *Lycaeninae* the great, mainly Holarctic group of untailed species as a separate subfamily, the *Plebeinae*, allied to the tailed *Lampidinae* (*boeticus* group) also separated from the *Lycaeninae*. The prevalence of eccentric movements of the hind-wings in the *Plebeinae* was probably associated with the former presence of tails, as maintained above.

A mode of protection analogous to the "false head" of the *Lycaenidae* had been observed by Prof. Poulton in an example of a S. American Struthious bird, a species of *Rhea*, in the Zoological Gardens at Perth, W. Australia (July 1914). When the bird was running away it seemed to be directing its gaze backwards at an enemy. The effect was produced by the appearance of an eye-ball-like convexity devoid of feathers over the ear. He had wished but had been unable to examine

the appearance at close quarters and determine how far the effect was due to form and how far to colouring. On returning from the visit of the British Association he wrote to his friend Mr. R. I. Pocock, F.R.S., who had kindly observed the Rheas in the Zoological Gardens and had seen the same effect in some of them. It seemed likely, however, from Mr. Pocock's account that the example at Perth was an exceptionally favourable one: there was even suggested the appearance of a dark iris on a paler eye-ball. It was quite probable that the effect deteriorated under the conditions of captivity.

[Shortly after the above paragraph was written, the following observation was received from Mr. C. F. Swynnerton, writing March 29, 1918, from Chirinda, S.E. Rhodesia. To give an enemy the impression that its eye was upon him would probably be advantageous to both *Rhea* and owl.—

—Talking of owls, I saw a very interesting thing once. I had a live *Glaucidium perlatum*, an owl the size of a thrush. One day, just after I got it, I offered it food in the forceps through the wire of the cage. It did not take it, and looking close, I found I was offering it to the back of the owl's head! The owl was asleep with its bill buried in its mantle-feathers, but on the back of the head had appeared instead the semblance of a bill and two great eyes, particularly the latter, which were formed by two oval patches of black feathers on the nape. I have little doubt that it is a case of mimicry, though the resemblance is to such an owl as *Syrnium woodfordi* rather than to the *Glaucidium* itself. The latter is pale round the eyes, the other dark. I sent an account of it to the S.A. Biological Society's Journal a long time back, but don't think they have yet published. My idea is that, while it might make the *Glaucidium* more liable to be mobbed, it will be useful in relation to birds of prey: for an owl that I tested on my carnivorous mammals proved unpleasant to them—not, of course, that this is conclusive.”]

Many other observations on insects were contained in Dr. Mortensen's paper. Thus it was extremely interesting to read of the Membracid genus *Sphingophorus*: “I saw them often alighting on leaves; they always fell on the side and then looked in the most wonderful way like a small piece of rotten

leaf, of which only the irregularly anastomosing ribs were left" (p. 85).

Mr. G. T. BETHUNE-BAKER said that on the edge of Dartmoor last year he took one or two *Strymon re-album*. K. each settled on the ground in the shade with wings closed over the thorax, and the hind-wings were quite still; again in the same month he took one *Zephyrus quercus*, L., on the ground with its wings well opened but with its hind-wings motionless: this also was in the shade. In both these cases the insects were on the road, and it was well after 6 p.m. He supposed that in each instance some shock had occurred in the trees above and that the insects had fallen to the ground. On the other hand, years ago at Tintagel he well remembered watching a ♂ *Polygonatus icarus*, Rott., sunning itself on the cliffs with partially opened wings and being struck with the seemingly rotatory motion of the hind-wings, and in the same sojourn he observed a ♀ ovipositing and the same motion occurring during oviposition. This latter point he recorded in the E.M.M. for 1901, p. 227.

A MIMETIC ASSOCIATION OF ITHOMINE BUTTERFLIES AND A RARE DIOPTID MOTH.—Mr. W. J. KAYE exhibited, on behalf of Mr. J. J. JOICEY, an apparently very rare Dioptid moth, *Dioplis pellucida*, Warr., (Nov. Zool., viii, 438,) very imperfectly described from a poor specimen from Rio Dagua, W. Colombia. Mr. Joicey's specimen, only the second known to us, is described as follows by Mr. Prout: This specimen of *Dioplis pellucida*, Warr., is a ♀ from El Tigre, Rio Jamana, Choco, and shows on the hind-wing a broad brown distal border (partly worn off in Warren's type but apparently there duller and less broad), which brings it into beautiful mimetic association with several Ithomiines occurring in the same district.

Mr. KAYE contributed the following notes on the mimetic association: The group of small Ithomiine species consisting of *Leucothyris amalda amaldina*, *Pseudoscada larinia troetschi* and *Hypoleria vanilia vaniliana*,* nov., occurring with the

* *Hypoleria vanilia vaniliana*, sub-sp. nov.

Fore-wing-like *vanilia vanilia* except that the inter-spaces between the veins are clearer and less suffused with dark smoky colour. The black discoidal spot, apical band and margin sharper black and the five

Dioptid moth *Diopthis pellucida*, all having a narrow hind-wing margin of reddish brown, is a West Colombian development of the better-known Bogota group with a much broader area of hind-wing colouring extending nearly up to the costa and covering the greater part of the wing. The Bogota species in association are *Leucothyris amalda amalda*, *Pseudoscada lucinia lucinia*, *Hypoleria vanilia vanilia* and *Pteronymia laura*, the last genus not being represented as far as is known in the former group. Whether any of the species could be called dominant in numbers it is difficult to say. None are common, but some other species of the genus *Pseudoscada* are abundant, and one might suspect in either case that the forms of this genus were commonest.

Two other species of the Bogota or Eastern group form a sub-group by themselves with a very heavy discal black band. These two are *Hypoleria aelia* (Hew., "Ex. Butt.," i, *nec* Hensch. in "Seitz," p. 142) and *Ithomia centromaculata* (Weyl. Berl. Ent. Zeit., xlv, p. 300, fig. 2). Both of these two, of which there has been such confusion as to their identity, are rare species, and the exact locality of either (it will doubtless be the same for both) is not known for certain. Hewitson's locality for *Hypoleria aelia* is River Amazon, and he says in the collection of Bates, but this is probably erroneous, and if Bates had it, it is most likely that it came from a Colombian locality. Of the Ithomiines surrounding the Dioptid moth the *Leucothyris* (*L. amalda amaldina*) is the closest in pattern, as it is the only species that has a black mark across the cell.

WASPS' AND ANTS' NESTS FROM JAVA.—MR. FRISBY exhibited an ants' nest, sent to him by Mrs. M. E. Walsh, F.E.S., from Soekaboemi, Java.

She wrote: "This nest was found on the ground with all the inhabitants dead. As everything was still fresh, an accident must have happened— but what?"

The nest, which is attached to the underside of a leaf, is of soft papery material, about $3\frac{1}{2}$ inches long, with the opening

white marginal spots clearer and whiter. Hind-wing with a brown patch between outer margin and cell, but not reaching the cell.

Hab. W. COLOMBIA, Rio Tamana, Rio San Juan, Choco, 400 ft., Feb. 1909 (*G. M. Palmer*) [*W. J. K.*].

or entrance at the end nearest the leaf petiole. The ants, which were sent in spirit, appear to be a species of *Polyrhachis*.

Mr. FRISBY also exhibited three cells of *Zethus cyanopicta*, a wasp of the family *Eumenidae*, also sent by Mrs. M. E. Walsh, F.E.S., from Sockaboemi, Java, and read the following note :—

Mr. H. O. Forbes, in "A Naturalist's Wanderings in the Eastern Archipelago," figures a nest of this species, with apparently a number of openings, which he says was composed of a number of chips of leaves glued together, the whole nest being protected from rain by a projecting roof of the same material, this roof itself being shaped like a leaf. In the specimens I have here the cells are simple. The question arises as to whether these cells would have been added to at a later period, or whether this wasp sometimes makes a communal nest and at other times only solitary cells.

LONGEVITY OF A COLEOPTEROUS LARVA.—The PRESIDENT exhibited a coleopterous larva, together with the box in and on which it had been living for some years. He said that it was the larva of a longicorn beetle, but was unable to state the species, and observed that similar instances of longevity were on record. He read the following letter which he had received with the exhibit :—

"DEAR SIR,

"I venture to send you a wooden pencil-box, which has been badly ravaged by the larva of some boring insect, as it may perhaps be of some unusual interest. The box has been in my possession for many years—probably over twenty-five, possibly still longer. The insect first made itself known—at least six or eight years ago, possibly more—by a loud ticking sound; so loud that it has often woke me at night, if I omitted to place the box in a cupboard or drawer. The sound was a clicking sound, like that of a cricket in the wall. I am unable to say in what country it first made itself manifest. The box has travelled with me widely—in India (including the Himalayas); in the Persian Gulf, Mesopotamia and the Turco-Persian frontier; around the shores of the Red Sea; in Egypt, Palestine and Syria; in Arabia (down

the Hedjaz Railway); in Asia Minor; in Greece, Turkey, Russia and many other European countries. Until about three months ago there was no visible sign of the insect's ravages; a hole then appeared in the body of the box: soon a large amount of white powder was produced: and very soon the box showed signs of rapid disintegration. I was then in Southern Russia. About two or two and a half months ago, while on the journey home, I found the larva loose in the box. It is enclosed in the box, separately wrapped in paper. Pray keep the box if it is of any interest, and in no case trouble to return it. I should be glad to hear the result of your observations on the larva, if it is not causing you too much trouble.

Yours faithfully,

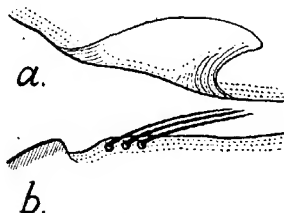
F. G. CLEMOW.

January 8, 1918."

JUGO-FRENATE GENERA OF MICROPTERYGIDAE.- Dr. TURNER read the following note on Mr. Tillyard's discovery in the wing structure of certain Australian Micropterygidae:

While carrying out his researches upon the Phylogeny of the Panorpid Orders, Mr. R. J. TILLYARD, M.A., B.Sc., F.L.S., F.E.S., Macleay Fellow in Zoology of the Linnean Society of New South Wales, has made a careful study of the Jugate Lepidoptera. The result of the study of five genera of the family *Micropterygidae* (sens. lat., including the *Eriocraniidae*) is that he finds them all to be, not of the *jugate* type of the *Hepialidae*, but of a more primitive *jugo-frenate* type, in which the wing-coupling apparatus closely resembles that of the Planipennia, Megaloptera and Mecoptera. On the hind-wing, near the base of the costa, there is a strongly developed frenulum of from two to six bristles (usually three or four), which becomes engaged, during flight, in the sinus formed between the dorsum of the fore-wing and the so-called jugum; this latter is bent *under the fore-wing* with its apex pointing outwards and forwards, and acts as a retinaculum for the frenulum, and not in any way as a jugum or "yoke" for the costa of the hind-wing, as it does in *Hepialidae*. The accompanying figure will explain these points clearly. Mr. Tillyard will shortly publish a full account of his researches,

and only sends this short note because of the present day difficulties and delays in sending communications from Australia to other parts of the world.



Explanation of text-fig.:—(a) Base of dorsum of fore-wing of *Micropteryx aruncella*, Scopoli, ♂, to show jugal lobe (jugum) tunned under the wing. Viewed from beneath ($\times 120$). (b) Base of costa of hind-wing of same, to show frenulum of three strong bristles. Viewed from above ($\times 120$).

Appeals.

By resolution of the Council an appeal was read from the Essex Field Club in behalf of a Pension Fund for their Curator and Secretary, Mr. William Cole, A.L.S., F.E.S.

An appeal for subscriptions towards the upkeep of Wicken Fen, forwarded by Mr. Rowland-Brown, was also read to the Meeting.

Wednesday, March 20th, 1918.

Dr. T. A. CHAPMAN, M.D., F.Z.S., in the Chair, in the absence of the President and Vice-Presidents, and on the motion of the Rev. G. WHEELER, seconded by Mr. COLLIN.

Election of Fellows.

2nd Lieut. WILLIAM PROCTOR SMITH, F.Z.S., Haddon House, Ashton-on-Mersey, and Messrs. JOHN HENRY WATSON, 70 Ashford Road, Withington, Manchester, and RONALD

SENIOR WHITE, Suduganga Estate, Matale, of the Board of Agriculture, Ceylon, were elected Fellows of the Society.

Election of an Honorary Fellow.

Dr. PAUL MARCHAL, President of the Entomological Society of France, 89 Rue du Cherche-Midi, Paris, was elected an Honorary Fellow of the Society.

There were no exhibits.

Paper.

"Observations on the Lepidopterous Family *Cossidae*, and on the Classification of the Lepidoptera," by A. JEFFRIES TURNER, M.D., F.E.S.

Dr. TURNER gave an abstract of his paper illustrated by drawings of venation, shown in the epidiascope. Dr. CHAPMAN, the Rev. G. WHEELER and Mr. BACOT commented upon it.

Wednesday, April 3rd, 1918.

Dr. C. J. GAHAN, M.A., D.Sc., President, in the Chair.

Election of a Fellow.

Dr. ALLAN GILLCOTT PARSONS, M.R.C.S., L.R.C.P., D.Ph., Sanitary Officer West African Medical Staff, and Temp. Capt. R.A.M.C., School of Army Sanitation, Aldershot, was elected a Fellow of the Society.

Exhibitions.

BLACK FORM OF PUTA OF PARARGE MEGAERA. - On behalf of Mr. PRIDEAUX the Secretary exhibited two black and two green living pupae of *P. megacra*, and read the following note : --

Of four larvae that have so far pupated from a few specimens of this species that have been reared from the egg during the winter, two are of the sooty-black colour, the other two

being normal green ones. These examples, all from S. DEVEN parents, were kept in warm rooms, and though sluggish in cold weather, the larvae never entirely ceased feeding: they all seem undersized, and have evidently fed up to maturity prematurely. The colour of the pupae of between twenty and thirty examples, reared several years ago from Isle of Wight parents, was in every case the typical light green.

LICE AND TRENCH FEVER.—MR. BACOT gave the following account of experiments as to the distribution of trench fever by lice:—

That this disease is spread by lice has been generally suspected since the second year of the war, and several isolated experiments have been recorded in which the infection has apparently been conveyed by lice that had recently fed on patients suffering from the disease. The number of instances, however, was too small and the conditions not definite enough to constitute a proof. Now, however, the work of the War Office Trench Fever Committee in this country, as well as that of the Joint American-British Committee working in France, has definitely proved that the disease is actually conveyed by the body louse (*Pediculus humanus*).

In England two volunteers allowed lice that had been fed on patients suffering from trench fever to feed upon them three times a day over a period of one month. The bites received were about 500 per day. Neither of them contracted the disease, but five volunteers, one of whom allowed infected lice to be crushed on a scarified skin area, and four who allowed the excreta of infected lice to be rubbed over a scarified patch of skin, suffered from the fever. In France the disease has been conveyed to a number of American volunteers by lice, but the method adopted differed somewhat from that employed here, and it is not possible to say with certainty whether the infection resulted from the bites or contact of excrement with abraded skin.

ANDROCONIA IN ORDERS OTHER THAN LEPIDOPTERA. The Rev. F. D. MORICE inquired whether androconial scales were known in insects other than Lepidoptera. He thought that he had discovered them among the Sawflies in the Australian genus *Perga* in one species of which there was on the underside

of all the wings, and in several others on that of the forewings only, a sort of fovea densely packed with hairs showing considerable structural detail. So far as he knew this character did not exist in any but male specimens. Dr. Dixey, Prof. Poulton and Lord Rothschild, to whom he had shown them, agreed with him that the hairs were probably of an androconial nature.

THE "TAPPING" OF *ANOBIUM STRIATUM* AND *A. PERTINAX*. - The PRESIDENT said that he had found the authority for Kirby's statement that Latreille had witnessed the "tapping" of *A. striatum* with its mandibles, but he suspected there was some error in identification of the species. Also that in the "Wiss. Zeit. für Insektenbiologie" for 1910 the Danish naturalist Jensen Haarup spoke of *A. pertinax* as tapping most vigorously before a storm and being regarded in Jutland as a weather prophet. As this was described as taking place specially in autumn and winter, the President considered it probable that the tapping was really made by the book-louse.

Comm. WALKER felt sure that he had heard *A. striatum* tapping where no *X. tessellatum* were present.

Wednesday, May 1st, 1918.

Dr. C. J. GAHAN, M.A., D.Sc., President, in the Chair.

Time of Meeting.

The President asked for an expression of opinion as to altering the time of meeting to 5 p.m., in view of the inconvenience caused by railway restrictions, as a guide to future action. Messrs. E. E. GREEN, BACOT, WILLOUGHBY ELLIS and TURNER spoke, and on a show of hands it appeared that the majority would be in favour of such a change.

Exhibits.

A SERIES OF *AGRIAS NARCISSUS*, STAUD. - Mr. W. J. KAYE, on behalf of Mr. J. J. JOCEY, exhibited a series of 8 ♂♂ and

1 ♀ *Agrias narcissus* from French Guiana. He said that from the time Staudinger described the species in 1862 till now, the insect had remained very rare and little known, which in the case of such a conspicuous species was remarkable. Outside French Guiana specimens had been taken in Surinam and at Obydos on the Amazon, but it now appeared as if French Guiana, from whence the species was originally described, was the real home of this gorgeous insect.

ANDROCONIAL SCALES IN SAWFLIES.—The Rev. F. D. MORICE exhibited three photographs showing scales apparently of an androconial nature in Australian sawflies of the genus *Perga*.

Prof. POULTON, Dr. DIXEY, Mr. BETHUNE-BAKER, the PRESIDENT and Dr. LONGSTAFF discussed the function of androconia generally, the latter speaking especially of their probable association with scent, especially in the *Lycenidae*.

OBSERVATIONS ON THE SEASONAL FORMS OF BUTTERFLIES, ETC., IN EX-GERMAN EAST AFRICA.—Prof. POULTON said that he had received the following interesting letter from the Rev. K. St. Aubyn Rogers, written at Kongwa, 20 miles N.N.W. of Gulwa Station on the Central Railway, due W. of Zanzibar, and about 200 miles from Dar es Salaam. High hills lie to the south between Kongwa and the railway.

“ Jan. 14, 1918.

“ I am quite sure that the seasonal forms of butterflies would repay a good deal more research than they have yet received. It is a very curious thing that the food-plant of *Belenois severina*, Cram., etc., grows freely in the dry season, but it is even more surprising that it does *not* make fresh growth in the *wet* season. Moreover, this bush is also the food-plant of *Teracolus eris*, Klug, as I have seen this species ovipositing on it at both seasons. Now *T. eris* is abundant here, and its seasonal forms are quite distinct and follow the seasons as every properly constituted butterfly should do, so that in its case larvae feeding on old leaves produce a wet form and those on young leaves dry forms!!

“ Our rains here began at the end of November and we had heavy thunderstorms on the 23rd and 27th. We had

some very light showers a week or two before. In December we had occasional thunderstorms only amounting to about $3\frac{1}{2}$ in., but this last week we have had lots of rain.

The first wet *Precis* did not appear till the end of December. *P. antilope*, Feisth., Dec. 27, and *P. sesamus*, Trim., Dec. 29, are my first records. Previously there was nothing but much-worn dry forms, so the wet forms have a very short season here. You will see that the seasons here are very similar to those in S. Africa—6 months wet and 6 months dry, but both begin later, so that the hottest months of the year are at the end of the dry season and beginning of the wet season. It is very curious that *Precis archesia*, Cram., produces the *limuoria*, Klug, form under these conditions. A good many Lycaenids and Hesperids seem to be confined to the wet season.

I was up at Kiboriani for two days last week, but the weather was not at all satisfactory, so I did not get much. *Acræa anacreon bomba*, Gr.-Sm., was plentiful and *A. acrita manca*, Thur., just coming out. I have quite 30 of *A. anacraon*, Trim., of both seasonal forms showing a considerable amount of variation. During the last three days down here I have taken 2 specimens of a form of *A. acrita*, Hew., or *A. chaeribola*, Oberth. (specimen sent *), with a heavy black tip and no subapical spots, so this form is found on the same ground as *A. acrita manca*, of which I have a long series taken at all seasons.

On my way down I got a real prize, my first specimen of a *Minacraea*. It seems to be intermediate between *M. marshalli*, Trim., and *M. dohertyi*, Roths., so far as I can judge. I am now quite sure I missed another on the same spot about 2 months ago.

I have a long series of *Belenois picta*, Neave, but only one specimen is like Neave's figure of his dry form. I have a good number taken in the dry season, but all except one have a quite different underside. Moreover, both seasonal forms show a good deal of variation in the amount of black

* Determined by Dr. H. Eltringham as *A. acrita ambigua*, Trim., *A.* Dr. Eltringham considers it very interesting that this form, originally described from N. Rhodesia, should have occurred in the area of *A. acrita manca*.

at the apex of the fore-wing, and in some specimens it is very much reduced, and the subapical spots of the underside of the fore-wing are in some cases quite obsolete.

"The *Charaxes theocles*, Cram., I took at Mambouya was ♀ form *phaeus*, Butl. [mimicking the ♂ of *Ch. bohrenanni*, Feld.]. I enclose a small piece of food-plant of the *Argemone*, I wrote about. I have little doubt that it is *A. satyrus*, H. H. Druce, but it is remarkable that it is so common here, as I believe it is generally a rare species."

Prof. POULTON said that he had sent the piece of *Loranthus* to Dr. Otto Stapf of the Kew Herbarium, who had kindly written: "The *Loranthus* you sent is probably a new species closely allied to *L. proteicola*, Engl., from the Kinga Mountains. I have not been able to match it exactly with any of our specimens. *L. proteicola* has been collected only once, and we have merely a fragment of it. I can therefore not say what its range of variation is, and whether your specimen may not come after all within that range. Mr. Sprague, who has monographed the African species of *Loranthus* over 200 species in tropical Africa alone- is at present in India on military duties."

THE CONFIRMATION OF DR. R. C. L. PERKINS' CONCLUSION THAT THE EARLY PALE SPRING FORM OF *PARARGE AEGERIA*, L. RACE *EGERIDES*, STAUD., IS PRODUCED FROM OVER-WINTERING PUPAE.--Prof. POULTON exhibited the specimens of *egerides* collected and bred by Dr. Perkins in 1917 together with the 1918 material, which confirmed the prediction published last year (*Ent. Record*, vol. xxix, p. 202, 1917). The former series had been kindly handed to him by Mr. H. J. Turner, who had exhibited it at the South London Entomological Society. The interesting evidence obtained in the present year was described in the following extracts from Dr. Perkins' letters and in his note:--

"April 5, 1918.

"In a few days now I shall, I hope, be sending you the new lot of 'Speckled Woods' bred from over-wintered pupae. I had very few of these pupae, and of these two died, one produced a cripple, and one shows no sign of hatching. The

series consists of 14 examples only, but they are quite enough, and I think you will find when you place them alongside of my last year's 'over-wintered larva' lot, bred last spring, that they will quite confirm my conjecture that the 'early' or 'pale spring form' is produced from wintered pupae, and the 'late' or 'dark spring form' from wintered larvae. I feel quite pleased at reaching a conclusion, as it has taken me three years to do so.

"One of the ♀♀ of this lot is quite a lovely thing, finer, I think, than that very nice one (in the pale spring lot) that I caught at Teignmouth last year. It is the most extreme form I have seen. The other chief point of interest, which remains an enigma and which I cannot solve by experiment, I can guess at the solution of. In several years I have noticed that although the light spring form antedates the dark one, yet before, and *even considerably before*, the first light form is seen at large, one or two dark specimens, closely resembling the dark spring form or the 2nd or summer generation of the butterfly, will be taken. I feel *quite sure* these are from *over-wintered pupae* also, but that these pupae are ones which *should* have hatched, to form part of the summer breed of the *previous year*. A year or two ago I had pupae from spring butterflies (the larvae pupated in July) which had not hatched in early November, but when brought indoors into a more or less heated room they produced butterflies that month. These would never have hatched out of doors till the spring, and I feel sure the few *dark*, very early specimens belong to this class. Probably it largely depends on climatic conditions in different years whether any of these or how many are seen in the spring. I took one in a Paignton lane this year on March 24th, and a torn one (which must have been out a week or more owing to the bad and cold weather we have had) to-day. Also to-day the first specimens of 'the pale spring form' were out in the lanes, but I don't suppose there will be any of the true 'dark spring form' (from wintered larvae) for 3 or 4 weeks yet, although the grass is now in splendid condition, and when this becomes really nutritious after the winter the caterpillars grow pretty quickly with good weather."

" April 16, 1918.

" In addition to the 15 *aegeria*, bred from over-wintered pupae, I am sending an example of the first wild spring form seen in 1918, one of several met with in a very short walk. It is a ♂, captured on April 5, the day on which one of the bred males emerged. They are very considerably like each other. I also send a dark wild male resembling a 2nd brood (summer) form. As referred to in the accompanying paper, it probably is a 2nd brood specimen, which, owing to retarded emergence, has over-wintered as a pupa, and should have been a last summer's butterfly."

FURTHER NOTES ON *PARARGE AEGERIA*, RACE *EGERIDES*. BY DR. R. C. L. PERKINS.—With butterflies which emerged at the end of August 1917 (these being part of the summer brood bred that year), pairings took place in the cages and eggs were laid from the first to the third week in September. As the weather became colder the larger caterpillars were placed in the warmest situation procurable (but not exposed to any artificial heat), and fed on the most luxuriant grass. In spite of this, many of them grew very slowly indeed, and consequently, there being no chance of their pupating, these were liberated, as had been already done with the greater number of the smallest larvae obtained from the September eggs. Eighteen pupae in all were obtained at the end of October or early in November. It was a noteworthy fact that of the 18 caterpillars from which these resulted, not one pupated on the growing grass within the cage, but all left this and attached themselves to the dry bark of the uprights or crosspieces that supported the covering. In this respect they contrasted very strongly with the pupae obtained in the early summer, for a large proportion of these were attached to the blades of grass. Also some of these winter pupae were extraordinarily dark, appearing almost black to the naked eye before the emergence of the butterflies. Two pupae died during the winter and one produced a cripple, the butterfly having, on emergence, fallen from the pupa-case, to which it was clinging, on to the damp earth beneath. The other 15, except that one or two were insignificantly damaged by

fluttering in the cage, were perfect specimens, several indeed might be called beautiful.

The reason why these pale spring forms are, all but two, ahead of the wild ones is because they were treated exactly the same as the last year's dark spring forms, or some of these. The pupae were exposed in their cage to the outside air in an eastern aspect during the (comparatively) severe weather of the past winter, but on February 18th four were brought into my study, where there was the usual temperature of a room heated through the day from an open fireplace. These four produced butterflies on the 6th, 8th (2) and 9th of March, all being males. The rest of the pupae were brought indoors about March 7, some already showing slight signs of approaching emergence, and the butterflies appeared from March 23rd to April 8th. Counting the crippled example, above alluded to, six in all were females. Although I have no specimens of my previous captures or bred examples for comparison, it seems clear to me that this bred series belongs to what I have called the "early" or "pale" spring form of *egerides*, and that my supposition, that this form must be the produce of over-wintered pupae, is correct.

There is, however, still one point in connection with the spring butterflies that I have not alluded to. Even earlier than the "pale spring form" in several years I have noticed, as a rare occurrence, the appearance of casual dark specimens, that look quite out of place amongst these more conspicuously spotted ones. A dark example of this sort I caught in a lane near my house on March 21st this year, and a tattered specimen, that must have been out for a week, at the beginning of April. The first wild specimens of the "pale" spring form were seen (several in half an hour) on April 5th, and these quite resembled my bred series. The occurrence of the very early dark butterfly is, I believe, to be explained in this way. In some seasons I have every reason to believe that some of the pupae that would normally result in a second brood fail to do so, and remain over till the following spring and then produce these dark butterflies, which much resemble some males of the 2nd or summer generation. One year, pupae that were obtained by me in July from spring butterflies had

not yielded *imagines* at the end of October, but on being brought indoors produced these early in November. Had they been left out of doors they would certainly not have hatched till the following spring. Consequently in S. Devon, so far as I can judge from three years' experience of breeding specimens and from special observation of living specimens, as well as from more general observations of these during earlier years, the following facts seem to be true :—

(1) There are always or generally two forms of the spring brood of *egerides*, a lighter (earlier) and darker (later) one.

(2) The former is from over-wintered pupae, the latter from over-wintered larvae.

(3) In some seasons a dark form appears even before the lighter (earlier) spring form, and probably results from pupae which normally should have hatched (as a second brood) during the preceding summer, but have failed to do so.

(4) As the spring forms overlap in their time of appearance, no doubt interbreeding between them takes place.

(5) No definite tendency to dimorphism, such as is seen in spring, has been observed in the second generation.

(6) Owing to the facts stated above, perfectly fresh examples of the spring butterflies can be found from March till well into June, the later ones not being a second brood, but the *imagines* from larvae that have hibernated, when still very small. It follows from this that the true second or summer brood is likewise very protracted.

(7) Whether there is a third brood, except as an entirely abnormal occurrence, is doubtful, at least under natural conditions.

(8) The second brood specimens resemble the darker (later) spring form rather than the earlier one.

How far these observations apply to the butterfly in other localities I do not know, but in Somerset and Gloucestershire I do not think the facts will prove greatly, if at all, different.

A FLIGHT OF WINGED TERMITES AT BARRACKPORE. - Prof. POULTON said that he had recently received the following letter from Mr. G. A. James Rothney, referring to Dr. G. B.

Long-staff's note on p. 37 of Shelford's " Naturalist in Borneo " (London, 1916) :

" Page 37. Termites.— ' The flight of the Winged Termites is a great event in the animal year.' "

" I can fully endorse this. I have had several flights of Termites in my different bungalows at Barrackpore, but one in particular at 33 Park Road is worthy of record. The bungalow was raised on low arches. These were bricked up and ventilations left, and various jungle animals ' Janwar ' used to scrape out the ventilators and use the arches as a sleeping abode. "

" One night in the Rains a big flight of Termites took place in the corner of my dining-room—they came out from the brickwork in thousands, shedding their wings all over the place as thick as leaves in a winter storm. I was soon driven from my dinner table, as dishes, plates and glasses were soon filled with them. Very soon— a few seconds it seemed the following collection of ' Janwar ' appeared on the scene, all devouring white ants :— "

" 1. Bats in numbers, several species hawking them about the room. "

" 2. Lizards—on the wall and floor, shikaring them. "

" 3. The Indian Crow—picking them up right and left. "

" 4. The Indian Mynah picking them up right and left, but more gently. "

" 5. A Musk Rat. "

" 6. The Indian Cockroach. "

" All the above within the dining-room. "

" In the verandah within the sphere of light : "

" 7. Pariah Dogs—several. "

" 8. Jackals—several. "

" 9. Jungle Cats—several. "

" 10. Mongoose—two. "

" On the steps of the verandah : "

" 11. Bull-frogs—several. "

" And outside in the Compound in the half-dark were certain other ' Janwars ' of sorts that appeared to be Civet Cats of some kind, and an uncouth figure looked like a

Hyena. The nuisance became so great that I was driven to my bedroom to seek the protection of the mosquito curtain, with the lights turned low, and in Biblical language 'they took up of the remains several baskets full,' that is, the 'Mehter'—sweeper—in the morning swept up a huge quantity of wings. I have experienced several incidents of this character, but this was a real 'Brock's Benefit' in White Ants."

Messrs. NEAVE, GREEN and BACOT commented on the edibility of Termites.

BRITISH CAPTURES OF *POLISTES GALLICA*, L.—Prof. POULTON said that he had received the following note from Mr. G. A. James Rothney, referring to the captures of *Polistes gallia* reported in the Entom. Proc. for 1916, pp. lxvi, lxvii:—

"The following note may be of some interest. Charles Horne, B.S.C., of Mainpuri, the author of a joint paper with Frederick Smith on 'Aculeate Hymenoptera of the N.W. Provinces, India,' is reputed to have captured *Polistes gallia* in the West of England in 1870-71. Frederick Smith told me of the capture in 1871, and evidently believed in its being genuine. He showed me at his house, 27 Richmond Crescent, Islington, a box of captures of English Aculeates made by Horne. I remember it distinctly; it was a rough square box of Indian make, and in one corner were several specimens of *Polistes gallia*—said by Horne to be English. Frederick Smith evidently believed in Horne's statement. At the same time he wished to follow it up further in case Horne might have mixed his English with Continental captures, as he had been staying on the Continent. Horne was quite positive about their being English and West of England—either Devon or Dorset. Frederick Smith arranged with me to go down the following year, 1872, to search for it thoroughly, and promised me he would get further particulars of the exact locality from Horne. It was a general custom with Frederick Smith to follow up his lead in this way, when his own Museum holidays would not permit his visiting the locality at the right time, as in the case of the sexes of *F. exsecta* at Bourne-mouth in 1868, but in Feb. 1872 I left for India, and the plan fell through."

Prof. POULTON said that Dr. R. C. L. Perkins, who possesses the F. Smith British Aculeates, had informed him that the collection contains 4 *Polistes gallica* of both sexes, with the note beneath them in Smith's handwriting: "Mr. Horne thinks that he took it near Swanage (Dorset)??" The existence of these specimens was recorded by Dr. Perkins in E.M.M., 1917, p. 229. Dr. Perkins had written: "I suspect *Polistes gallica* has been not infrequently brought over with shrubs or in other ways, and has once in a way started a colony only to be sooner or later exterminated by our climate. Three species of *Polistes* (one American and two Oriental) have become fully established in the Hawaiian Islands from accidental importations, and many specimens of a S. American species were brought in steamers to England (1866-1869). These also are in F. Smith's collection."

GIANTISM IN MALE BEES.—Prof. POULTON exhibited the illustrative specimens and read the following paper for Dr. R. C. L. Perkins, who, he much regretted, was unable to be present. Extracts from two letters by Dr. Perkins threw further light on this interesting and difficult problem, and explained how Dr. Perkins came to study it.

"March 13, 1918.

"A few years ago, when writing my unpublished account of *Andrena* and its parasites, I puzzled much over the giant males, and could think of nothing but the suggestions I have written in the accompanying note. It seems very curious that neither Saunders nor Smith nor any others, so far as I know, seem to have paid any special attention to this subject."

"April 16, 1918.

"I begin to think that difference in size of *Andrena* must be somehow due to the amount of food. It is very hard to investigate the matter here. I got out about a dozen cells of *Andrena clarkella*, Kirby, the other day, and all the pollen lumps appeared to the naked eye about the same in size. When my boys came home and saw these they both exclaimed at once, 'What small lumps, much smaller than the ones we got the other day!'—from a neighbouring colony. They did

not bring these home, but I feel sure they were right. Still, I cannot understand the uniform size of the ♀♀. The ♂♂ are *all* sizes, with occasional *gigantic* ones. The ♀♀ all uniform in most *Andrena*, with very rarely one about half the proper bulk.

"The most favourable (*i. e.* for variation) species to investigate do not make compact colonies like *clarkella*, but burrow singly, scattering over perhaps a whole field—I mean the favourable species in this locality. A very easy one to investigate would be *A. fulva*, Schr., which produces gigantic ♂♂ freely in 'the Parks' at Oxford and makes big colonies, but unfortunately it is not here at all. Also our soil is not very easy to dig in—an extraordinarily wet clay at the roots of trees, where the *clarkella* were nesting.

"I may chance on some better colony soon. I badly want larvae of the bees *Nomada* (parasitic on *Andrena*). No one knows whether both host and parasite lay eggs on the same pollen mass, and the latter larva kills the other, or what happens. The want of *exact* information as to the habits of the cuckoo-bees is simply astonishing."

Giantism in Male Bees, by Dr. R. C. L. Perkins.

No one who has examined a considerable collection of bees of the genus *Andrena*—or, in fact, of some other genera—can have failed to notice the occasional occurrence of individuals of the male sex of gigantic size. This giantism has been observed by me in nearly all our British species of *Andrena* and probably occurs in all. Great variation in size, whether this be in excess of the average or in decrease, is of course a very familiar phenomenon in many insects, but owing to the nature of the nutriment of the larvae and the manner in which this is provided, it is of particular interest in the case of the solitary bees. So far as we know the amount of food stored in the bee's cell to serve as food for the larva varies little, though certainly it is desirable that accurate investigations should be made on this point. At the same time the comparatively uniform size of the females, excepting in special cases to be noticed, confirms the impression made on me by the examination of actual stored pollen

masses, that the mass of food stored is not subject to much variation. As just stated, the size of the female of a species is not very variable, except as a rare occurrence, and this rare variation appears always to consist in great diminution of size, so that the individuals affected are comparatively dwarfs. In looking through a large number of such individuals I find that these dwarfs appear, as far as one can judge, to be about half the weight of normal examples, and one is led to suppose that they are produced from two eggs having been laid in a single cell of the bee, a fact which is known to take place in some instances.

The variation in the males is less regular, dwarfs occur as in the females, and specimens both notably above or below the mean size are frequently observed, but amongst these there stand out conspicuously the giant individuals, as a phenomenon quite distinct from anything observed amongst the females. We may note that these huge males frequently approach closely in bulk that of the average-sized female, but it is a matter of great doubt how they are produced. It can hardly be a question of a simple surplus over the usual amount of food, since gigantic females do not occur, unless we suppose that the surplus nourishment goes to form superior size in the case of one sex and some other development in the other. This is not inconceivable, since we know that the drain on the strength of *Andrena* by the parasite *Sigalphus* is such as to cause almost invariably, if not always,* a degeneration of the ovaries in the females, these organs requiring much nutriment, while in the males, according to my own observations, practically confirmed by those of Geoffrey Smith and A. H. Hamma, little or no degeneration of the comparatively small genital glands is produced. Consequently a surplus of food might in the case of the females be used up in the nutriment or growth of the important ovaries, while this might be used for a general increase in size in the males.

We know, from observations on cells superimposed one on the other and with only one exit, that the eggs which will produce males and those which will produce females are not

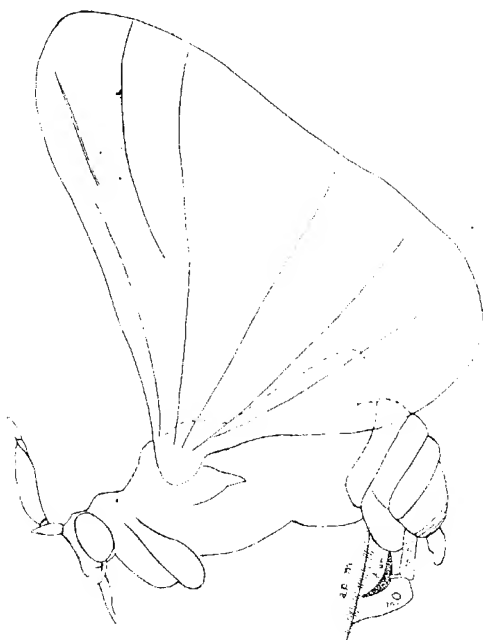
* According to the observations of Geoffrey Smith and A. H. Hamma.

laid indiscriminately, but, when both sexes are present, that the upper cells produce males, which emerge first, the lower females, which emerge later, and it is conceivable that the food supplied to these cells is different in some respects. A male bee in such a case might conceivably be changed in size, if bred on food normally supplied to a female, but there is no evidence that the food in different cells of one species varies in quality, although the proportion of pollen to honey varies greatly in the case of different kinds of bees.

The following facts seem to be almost or quite constant :-

- (1) Giantism is only exhibited by the male sex.
- (2) Truly gigantic males are a very small percentage of the total number of individuals.
- (3) A gigantic male may be taken from the same burrow as normal ones.
- (4) There is no striking development of secondary sexual characters in such males. Thus when there is a special tooth on the mandibles, or the cheek is armed with a special spine in the male, these do not undergo any extraordinary development in gigantic individuals. There is, for instance, no change comparable with that exhibited by the teleodont and other forms of Lucanid beetles or in the horns of Dynastids.
- (5) Though they approach the normal female in bulk, and consequently in some cases somewhat resemble that sex in superficial appearance, there is really no accession of female characters in any respect.
- (6) They fly with and behave like normal individuals and appear perfectly healthy.
- (7) The presence of the parasite *Stylops* does not necessarily prevent giantism, as gigantic males have been found containing this parasite.

THE PAIRING OF *STYLOPS* AND "ASSEMBLING" OF THE MALES OBSERVED BY DR. R. C. L. PERKINS. Prof. POULTON said that he had received the following three letters and the accompanying specimens and drawings from Dr. Perkins, who was unfortunately unwell and unable to be present and give an account of his most interesting and important discoveries. All were written at Paignton, S. Devon.



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STYLOPS ATERRIMA male (legs omitted) IN COPULA
with female.

" April 22, 1918.

I think the following may interest you, as I believe I told you I was taking exception to Geoffrey Smith and Hammon's conclusions (in the Quart. Journ. Microscop. Sci., vol. 60, Pt. 3, Sept. 1914, p. 435) as to the impossibility of fertilisation of ♀ *Stylops* and the uselessness of the ♂! In the continuation of my papers on *Stylops* in E. M. Mag. (1918, pp. 67 and 73) I have given strong arguments of a theoretical character against these conclusions, but this morning at 8.30 a.m. I bred a ♂ *Stylops aterrima*, Newport, and soon afterwards obtained an evident pairing between it and a ♀. It is curious that I should have succeeded at the first attempt. I was astonished at the extraordinarily rapid manner in which coupling was effected. Twice the ♂ *Stylops* was brushed off by the bee (*Andrena trimmerana*, Kirby) before it properly mounted it, but the third time it got fairly on and in a second or two was coupled with the minute projecting part of the ♀. I had to carry it to another room and find a cyanide bottle to kill it, so that it remained coupled in life for probably 1-2 minutes, and in addition it took say 30 sec. to 1 min. to kill the bee. In spite of this, it still remains attached to the ♀ in the manner shown in the sketch, reproduced in Plate A.

" *ab. pl.* is the (generally reddish) oblong abdominal apical ventral plate of the ♂, from which the aedeagus may be seen entering the 'brood opening' *b. op.* of the ♀ cephalothorax (*i.e.* really an opening between head and thorax).

" *m.* is the rudiment of the mandible of the ♀ puparium (or of course what one sees is not really the actual ♀ but the puparium in which it lies).

" *ap. m.* is the apical margin of the bee's 4th segment, from beneath which the ♀ cephalothorax projects.

" The cephalothorax of the ♀ *Stylops* is seen from the side, so that only one of the mandibular rudiments is visible.

" The drawing was made in lateral aspect by camera lucida many hours after death, so that contraction of the long slender ♂ body had taken place.

" If the ♂ *Stylops* does not become detached in the great

contraction that takes place in drying it might be worth while exhibiting *in situ* on the bee.

"The ♂ *Stylops* is in lateral view, the legs are omitted, only the left antenna and maxilla (or palp), the clavate (rudimentary) front wing or elytron and the hind-wing being shown."

April 24.—"This morning, though changed in position from great contraction of itself and also partly from that of the *Andrena*, the ♂ *Stylops* was still attached to the ♀. To-night, on taking it out of the box, it became detached, no doubt from the slight jerk caused by withdrawing the bee's pin from the cork. I have therefore mounted it on card in such a way as to give a good enough view of the pick-like aedeagus in some aspects. I have no other specimen of this *Stylops* so satisfactory for examination, though I shall not have time to make preparations of parts till after you exhibit it, if this is now worth while.

"The bee from which it emerged contains the ♀ with which it copulated, so they may be brother and sister.

"When the fog cleared at midday to-day and the sun shone brightly, I went up to the *Stylops* locality. I did not get any ♂ *S. aterrima*, indeed it is now late for that here, but immediately I got to the place, where (it being entirely sheltered from the E. wind) it was very hot indeed, I saw 2 ♂ *Stylops* hovering close to a very dense and stiff flowering head of gorse. I netted these, hitting the bush in doing so, and found a number of *Stylops* in the net! While I was boxing the first (they were extraordinarily wild and active in the net and difficult to box). I distinctly saw one or two get out through the meshes of the *mosquito* net which I use for bees, and I know not how many escaped. Anyhow I secured 4 fine specimens. I cannot doubt these ♂ ♂ were 'assembling,' for in two long hours along that hedge of gorse I saw no other specimen, and in the thousands of bees that were out I saw only 3 *styloped* individuals.

"One of these 4 ♂ ♂ paired with a ♀ on my return home, but it parted or the bee got rid of it before I could kill them. This species was *Stylops willkellae*, Perkins, a species excessively close to *S. melittae*, Kirby, that Hamm investigated.

" I expect the ♀ has to be very fresh to attract the ♂ ;, for if not fertilised the eggs start developing parthenogenetically, and then probably she will not call the ♂ ♂."

" April 27.

" I have to-day had another go at *Stylops* in the field, and this will probably complete my observations for this year, as most of our *Stylops* are now over for the season.

" On the 25th I took my eldest boy to Churston, between here and Dartmouth, as *Andrena nigroviridis*, Kirby (host of *Stylops melittae* - Geoffrey Smith's and Hamon's species, common in the Parks at Oxford) is commonly stylopedised there. Unfortunately we only found a few, from which the ♂ *Stylops* had emerged, and some with ♀ ♀, and we saw no *Stylops* on the wing. However, my fever was still high and the sun was very hot, and consequently I had to sit down in the shade for a considerable part of the few hours I was out.

" On the 26th I did no *Stylops* work. To-day I started about 9.30 (i. e. 8.30 a.m. old time) to the *Stylops* field near my house. The gorse hedge was still partly in shade and the grass very wet with the heavy dew, but at the very same bush where I found the other 'assembly' I saw one or two *Stylops* hovering and struck at these. I boxed 6 ♂ ♂ from this stroke, and some escaped through the meshes! One of these I caught in my hat as it flew off (this being included in the 6). This was about 10 a.m. (9 a.m. *cere*). I saw no more for more than an hour, when at the other extremity of the long field several were seen hovering above and behind the gorse (which forms the front of the hedge) about a lot of briars and brambles. On a dead still stem of briar I saw a space of several inches *absolutely white* with a moving mass of ♂ *Stylops* just close to where the others were hovering. I struck at these, but got hopelessly caught up in the thorns, and I could see many of the *Stylops* escaping from the net. When I got free, I boxed 7 ♂ out of the net, and still some others escaped through the meshes. I distinctly saw a stylopedised ♀ *Andrena wilkella*, Kirby, fly heavily off when I struck at the *Stylops* on this occasion. There could not

possibly have been less than 50 ♂ *Stylops* in the original assembly, but when I looked up after boxing the 7 (which took some minutes, as they are so wild in the net) I could see no trace of any remaining. At about 11.45, having seen no more, I went away from the hedge into the field to see if any ♂ *Stylops* might be seen about the burrows of *A. wilkella*, and if the bees themselves were in any numbers. So far I had only seen two of the Andrenas on the hedge—both styloped. The burrows did not appear numerous, being scattered over most of the field, one here and one there, and not forming a compact colony, such as I have often seen in the sandy lanes near Shotover. I captured every *wilkella* I saw, 26 in all, of which 25 were styloped and 1 ♂ bee only healthy!

"It must not be supposed that practically all the *A. wilkella* in the field are styloped—there is a strong tendency for styloped examples to emerge a week or even two weeks before the average date of appearance of the healthy ones. Therefore one may go to this field a fortnight hence and very likely get plenty of healthy and very few styloped ones. Also styloped bees are much easier to catch than healthy ones. For this reason the percentages of styloped to healthy bees given by various authors on particular occasions is of very little real value.

"Except in one case all the 25 styloped bees contained either ♀ *Stylops* or empty puparia of the ♂. One contains a full ♂ puparium, but the protruded part of this is daubed over with a patch of the red soil, which has prevented the emergence of the insect. I took several of these styloped bees and placed them in slightly opened boxes in the gorse bushes, but nothing was attracted, as I had hoped might happen. While collecting these bees, I saw a single ♂ *Stylops* pass high overhead (I could not reach it with my net, which was on a 3 ft. stick) in the middle of the field, flying straight across, but I lost sight of it after a while.

"At 1.15 p.m. (12.15 *vere*) I captured a ♀ *wilkella* containing 2 ♀ *Stylops* more than usually extruded. I held this in my hand by the head and thorax with the abdomen fully exposed to the sun. Within five or six minutes I caught

♂ *Stylops* flying about 3 ft. above the grass towards me, and one other escaped, being carried off by a sudden and rather strong puff of wind. Whether these were actually attracted by the ♀ *Stylops* I had had in my hand I do not know, but I strongly suspect that they were.

"It is extremely probable, I think, that the ♀ *Stylops* at a certain (perhaps very brief) period of its life is highly attractive to the ♂. It is quite possible that this attractive stage may be sometimes lost before ever the bee leaves the burrow, and in that case the eggs develop parthenogenetically.

"It is noteworthy that on this lovely summer-like day, from 9.45-1.15 being spent in the *Stylops* locality, only one ♂ *Stylops* was seen singly, all the others were actually in 'assemblies' or flying in one direction and one after the other, as if to form one."

Dr. DIXEY commented on the physiological significance of "giantism" and its possible cause.

Paper.

The following paper was read :—

"The *Charina* group of *Pinacopteryx*," by F. A. DIXEY, M.A., M.D., F.R.S., F.E.S.

Dr. DIXEY illustrated his paper by the exhibition of specimens. He pointed out that this assemblage of species or subspecies differed from the remainder of the genus by the character of its scent-scales, and also, as had been noticed by Dr. Eltringham, by the possession of a single posterior spine to the clasper instead of two spines as in the *pigea* section of *Pinacopteryx*. The uncus also exhibited distinctive features. The various forms included in the group might be most conveniently ranged under the following heads :—

1. *P. charina*, Boisd., inhabiting Cape Colony, Natal and the Transvaal.

2. *P. simana*, Hopff., originally described from Mozambique, and occurring throughout Rhodesia, Portuguese and "German" East Africa, British East Africa (with the exception of the district surrounding Mombasa), and Uganda.

3. *P. liliana*, Gr. Smith, the form peculiar to Mombasa and the immediate neighbourhood.

4. *P. gerda*, Gr. Smith and Kirby, a form closely allied to the preceding, but separable, and inhabiting an adjacent region of British East Africa.

5. *P. venata*, Butl., originally described from the White Nile, and found also in Abyssinia, Southern Kordofan and the Southern Sudan.

The type of *P. dara*, Godt., belongs to this group, but being a female of unknown locality and in bad condition, it cannot be determined with certainty. The forms above mentioned are probably best regarded as geographical subspecies; at present they appear to be distinct, but further information may show that they intergrade in certain localities.

Wednesday, June 5th, 1918.

Dr. C. J. GAHAN, M.A., D.Sc., President, in the Chair.

Election of a Fellow.

Mr. LUBYN R. D'ALBREU, 3rd Divisional Signal Company, Mesopotamia Expeditionary Force, was elected a Fellow of the Society.

Proposed Alteration of Bye-law.

The Secretary announced that it was proposed at the request of the Treasurer to amend Chapter VIII, clause 5. as follows:—

The Council shall nominate a Chartered or Incorporated Accountant annually who shall audit the Treasurer's accounts. The Auditor shall be paid a fee, the amount of which shall be agreed by the Council on behalf of the Society. The Treasurer shall furnish the Accountant with all the facilities he may require for auditing the Accounts.

Exhibitions.

PREPARATION OF *TIMARCHA TENEBRICOsa*.—Mr. HUGH MAIN exhibited subterraria with larva and pupa of *Timarcha tenebricosa*, and called attention to the colour of the pupa, which was similar to that of the red fluid emitted by the imago, and of the ova and newly moulted larvae.

A DIPTERON NEW TO THE BRITISH LIST.—Mr. J. E. COLLIX exhibited specimens of *Eumerus tuberculatus*, Rdl., a Syrphid new to the British List of Diptera; also specimens of *Eumerus strigatus*, a species under which it may easily have been placed in collections. Both species had been reared by Mr. J. C. F. Fryer from larvae found in Narcissus bulbs grown at Taplow (Bucks.).

He pointed out that though *E. strigatus* had been recorded from the Continent as attacking onions and potatoes, in addition to Narcissi, no such attacks had been noted in the British Isles, indeed at Taplow onions grown between the rows of the infested Narcissi remained uninjured. In 1917, however, *Eumerus* larvae were found in a previously unrecorded food-plant, viz. parsnips, grown in the Evesham district of Worcestershire, and the specimens of *E. strigatus* exhibited were some of those reared from these larvae.

The headquarters of the genus *Eumerus* is the Mediterranean region, and *E. tuberculatus* is an Italian species which has remained unrecognised ever since it was originally described in 1857.

THE MODERN USE OF THE WORD "CAMOUFLAGE."—Prof. PORTON said that he wished to enter a mild protest against the modern use of "camouflage" for Protective and Aggressive Resemblance (Procrypse, Procryptic, and Anti-crypse, Anti-cryptic). "Camouflage" did not appear as an English word in Murray's Dictionary, but "Camouflet" was in use in 1836, with the following meaning:

"A mine containing a small charge of powder, placed in a wall of earth between the galleries of besieged and besieger, so as, in exploding, to bury, suffocate, or cut off the retreat of the miner on the opposite side; a 'stifler'."

"1836 in *Penny Cycl.* VI, 197/I. *Camouflet* or *Stifler*."

"Camouflage" might therefore be properly used for the defensive discharge of the Bombardier Beetle and many other *Carabidae*, and for the use of suffocating or irritating secretions generally, but was a most inappropriate term by which to express a concealing coloration.

BUD-AND-FLOWER-LIKE FLATIDAE (HOMOPTERA) FROM EX-GERMAN EAST AFRICA.—Prof. POULTON exhibited beautiful examples of the green bud-like *Ityraea speciosa*, Melich., and the many-coloured flower-like *I. nigrocincta*, Walk., collected by Mr. A. Loveridge at Mrogoro, on the Central Railway, about 100 miles W. of Dar es Salaam; also specimens of the orange-red, flower-like *I. gregoryi*, Dist., taken at Kilwezi, British East Africa, by Mr. W. Feather. All these specimens, which had been kindly sent by Mr. E. C. Chubb of the Durban Museum, were bright and fresh and gave an unusually striking impression of the bud-and-flower-like appearance.

The flower-like *nigrocincta* were, in the resting position, scarlet anteriorly, passing into a narrow zone of orange followed by a broad one of very pale blue, and this by a still broader terminal area of very pale ochreous. The forewings of the green *speciosa* were encircled, except near the hinge, by a narrow red line enclosed within a narrow marginal black one, with a much stronger development of both red and black on or near the costal border, accompanied by bright yellow markings and a vivid bluish green modification of the ground-colour. In spite of the obvious differences between the patterns there were resemblances between the black markings which suggested, as Mr. Loveridge believed, that they were the dimorphic forms of a single species: and the same element in the pattern rendered it probable that the more northern *gregoryi* was the flower-like form of another dimorphic geographical race of the same species, separated from the southern race by colour differences only.

Among other interesting observations on the *Ityraea* made in 1917-18 in the ravine of the river at Mrogoro, Mr. Loveridge noticed that the green forms were much rarer— at first about 1 to 11, later 1 to 10—and much easier to catch than the blossom-like forms. The latter were often found *in cop.*: once the two different forms were thus taken, and on the

same occasion a green pair and a blossom-like pair were also captured *in cop.* Mr. Loveridge also took individuals exhibiting a gradation between the two forms. With this evidence, and especially that furnished by the pairing of the different forms, there could be no reasonable doubt that Mr. Loveridge was right in concluding that the Mrogoro forms were the same species.

A full account of the observations had been communicated by Mr. Loveridge to the Zoological Society of London. It should be added that neither Mr. Loveridge nor Mr. Feather had seen the insects arranged in the manner represented by Prof. Gregory in "The Great Rift Valley," an arrangement which, however, had been confirmed by other naturalists.

S. NIGERIAN LYCAENINAE BRED FROM LARVAE FEEDING ON A SINGLE SPECIES OF LORANTHUS. CATOCHRYSOPS PHASMA, NOT PARSIMON, PROVED TO BE MYRMECOPHILOUS. Prof. POULTON exhibited the following eight species bred in 1917-18 by Mr. C. O. Farquharson at Moor Plantation, near Ibadan, S. Nigeria. Except when otherwise stated both sexes were present. Mr. G. T. Bethune-Baker had kindly helped in the determinations, some of which were difficult.

(1) *Epanera iasis*, Hew.; (2) *Epanera* sp.; (3) *Epanera lani*, Hew., ♂ only; (4) *Argiolaus alcibiades*, Kirlb.; (5) *A. julus*, Hew., ♂ ♂ only; (6) *A. moesa*, Hew.; (7) *A. panepetala*, H. H. Druce; (8) *Tanuetheira timon*, F.

Mr. Farquharson had thus greatly extended the investigations briefly alluded to in Proc. Ent. Soc., 1917, p. lxi. The species of *Catochrysops* of which the pupae were found by Mr. Farquharson in the subterranean nest of *Camponotus maculatus*, F., was not *parsimon*, F., as stated on the page referred to above. Mr. Bethune-Baker had examined the male genitalia and found it to be *C. phasma*, Butl.

NEW MIMETIC FEMALE FORMS OF CHARAXES ETHALION, BOISD., AND ETHEOCLES, CR., AND BRED MALE-LIKE FEMALES OF THE LATTER. Prof. POULTON exhibited examples of the following forms:—

Charaxes ethalion, Boisd., new ♀ forma mimetica swynertoni. —This is the ♀ form *d* described and figured but not named by Lord Rothschild and Dr. Karl Jordan in Nov. Zool., vol. vii,

1900, p. 479, pl. xii, fig. 6. It is defined by the "band and spots" of the upper surface being "pale blue except the upper postdiscal spots," which are generally white as in form *a*, but sometimes buff as in *b*, or blue though paler than the rest of the markings. The admarginal spots of the U.W. upper surface are dull red above, olive green below (viz. towards the anal angle). Now that this form is so much better understood, its mimetic relations clear and genetic relations partly so, it is convenient that it should be named, and I propose to dedicate it to the naturalist to whom we owe nearly the whole of our knowledge on the subject.

Type in Hope Department: one of the females (with white upper post-discal F.W. spots) which emerged Dec. 13/14, 1917, of the family recorded on p. lxxxi. Chirinda, S.E. Rhodesia.

Within the limited area of Chirinda forest in S.E. Rhodesia the males of this species of *Charaxes* are accompanied by females of the form *rosae*, Butl., mimicking the females of *Ch. cithaeron*, Feld., one of the dominant larger species in the forest, by *swynnertoni* females, mimicking the males of *cithaeron*, and by the usual female found wherever *ethalion* occurs, i.e. the ♀ f. *ethalion* which probably mimics another large species, *Ch. brutus*, Cr. Inasmuch as *rosae* has been, in other localities, accepted as a female form of *etheodes* the question arose as to whether the Chirinda forest harboured this species or *ethalion*, or a mixture of the two. Dr. Jordan therefore kindly examined the armature of 4 males and found all to be *ethalion*, rendering it highly probable although not certain that at Chirinda the *rosae* ♀ f. belongs to this species.* Mr. Swynnerton's two families bred from known females do not throw any light on this question, although they prove that *ethalion* and *swynnertoni* belong to the same species and render it nearly certain that the relationship between them

* Since the above paragraph was written, Mr. H. Dollman has exhibited, Dec. 4, 1918, bred specimens of the *manica*, Trim., and *phaeus*, Butl., females, from N. Rhodesia, and has proved that these forms, both hitherto regarded as *etheodes*, belong to distinct species. I believe that the genitalia of the accompanying males will show that *manica* is *ethalion* and that *phaeus* is *etheodes*. If this be confirmed there can be little doubt that *rosae*, which resembles *manica*, is also a form of *ethalion*.—E. B. P., Dec. 28, 1918.

is Mendelian, although which female form is dominant and which recessive remains unsettled.

The first small family, bred in 1913 from the eggs laid by the ♂ f. *ethalion*, produced males, 2 *sequevertoni* females and 1 *ethalion* ♀ of form *b*. The second family from the eggs of a *sequevertoni* female produced 17 males and 14 females of the same form as the parent. The tendency for the males to emerge earlier is well shown in the tabular statement :—

Dates of Emergence in 1917.	Males.	Females (all <i>sequevertoni</i>).
Dec. 10	4	3
„ 11-12	7	1
„ 13-14	4	3
„ 15-18	2	7
Totals	17	14

It is much to be hoped that Mr. Swynnerton may be able to breed from the ♀ f. *rosae* and also succeed in making the Mendelian relationship perfectly clear—for the first time in a *Charaxes*.

Charaxes ethioides, Cr., new ♀ f. *m. coppersi*.—Differs from the ♀ f. *m. kirki*, Butl., in the discal band of the H.W., which instead of being “white, slightly bluish proximally, and with a faint trace of ochraceous at distal edge” (Rothsch. and Jord., *ibid.*, p. 486), is, in the typical form, orange-ochreous throughout, thus transforming a mimic of the ♂ *ansorgei*, Rothsch., into a mimic of *saturnus*, Butl. This latter resemblance is also promoted by the tendency of the F.W. bar in some individuals to broaden and suffuse the dark ground-colour with orange-ochreous.

Type, in Hope Department, from Dabida, about 100 miles W.N.W. of Mombasa, June 22, 1916. A similar form from Maketao, between Taveta and Voi, July 11, 1910. Four examples from Dabida (1916), and one from Taveta (*in cop.*, Apr. 26, 1905, with a ♂ of the f. *chanleri*, Holl., determined

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by Dr. Jordan), are transitional between *rogersi* and *kiki*, but the development of orange-ochreous is such that the resemblance to *saturnus* would probably be strong. Of 2 further examples from Dabida (1916) one is very nearly and the other fully the ♀ f. *kiki*.

This interesting change in the mimetic likeness as *kiki* ranges eastward in the southern part of British East Africa was recognised by the Rev. K. St. Aubyn Rogers (Trans. Ent. Soc., 1908, p. 507, footnote), who captured the whole of the above-mentioned examples (see also Proc. Linn. Soc., 1915-16, pp. 32-33).

C. ethocles, new ♀ f. *m. carpenteri*.—Differs from the ♀ f. *m. regalis*, Rothsch., in the following points: (1) the more angulated direction and more distal position of the blue band crossing the H.W., so that it is continuous into the series of post-discal F.W. spots; (2) the disappearance of the two last blue discal F.W. patches which form so conspicuous a feature of *regalis*; the two last small blue patches of *carpenteri* follow the post-discal and not the discal series, of which only the upper spots in areas 2, 3, 5, 6 are represented; (3) the discal and upper post-discal F.W. spots are not buffish but white with an intermixture of blue scales; (4) the greater size and prominence of the white submarginal spots, and far smaller development of dull red in the admarginal spots, of H.W. The red in these spots is restricted to a narrow line with peacock-blue borders; then follow peacock-blue spots, becoming olive green at the anal angle.

The wings within the discal spots of F.W. and blue band of H.W. are faintly iridescent dark blue-black as in *regalis*. The effect of the above differences is to produce a mimetic likeness to the ♂ of *Ch. etesipe*, Godt., of which examples were taken in the same forest on July 8 and 13, 1915.

Type, in Hope Department, taken by Capt. Carpenter in the forest near Kakinu, 31° 30' N., 1° 10' S. (Proc. Ent. Soc., 1915, lxxv, 1916, ex), Aug. 3, 1915. Another worn specimen, taken May 19, 1915, differs in the H.W. blue band being represented by a series of separate spots, in the whiteness and greater size of the discal F.W. spots, and in the greater development of red in the admarginal H.W. spots.

In the fresh condition this specimen was probably an even better mimic than the type.

Bred *C. ethioides* with male-like females from S. Nigeria. - Eight remarkable females have been bred by Capt. W. A. Lamborn and Mr. C. O. Farquharson, who first found the larvae on *Adenanthera pavonina* (Mimosoidae) at the Agricultural Department, Moor Plantation, near Ibadan, S. Nigeria. The period of pupation is shown in the following table: -

Larva Found.	Date of Pupation.	Date of Emergence.	Sex.
Dec. 2, 1913	Dec. 8	Dec. 16	♂
" 5, "	" 12	" 21	♀
" 10, "	" 15	" 26	♂
" 11, "	" 17	" 26	♀
Unrecorded	" 21	Jan. 1, 1914	♀
"	" 21	" 1, "	♂
"	Unrecorded	" 5, "	♂

In addition to these specimens sent to me by Capt. Lamborn, I have received 3 males and 5 females, bred, except 3 without records, July 31-Aug. 6, 1915, by Mr. C. O. Farquharson.

Considering the rarity of male-like females in *ethioides* it is astonishing that all these should be male-like. Indeed Dr. Jordan, after seeing them, suggested the possibility that they had been affected by the artificial conditions. On the other hand, the 1913 females were only in confinement as larvae for a few days, while the size of nearly all the specimens proves that the conditions were quite healthy. On the whole I think it probable that the dominant females of this S. Nigerian locality are male-like and co-mimics, with the males of *Ch. unmenes*, Hew., of the males of *Ch. tiridates*, Cr. I have not as yet received any captured females from the locality.

No one of these bred females is very like the form *alladinis*, Butl., or *virilis*, Rothsch., although nearer to the latter. But among themselves they differ so widely in detail that I

hesitate to name them, preferring to consider them, at any rate for the present, as forms of *civilis*. In most of them the upper discal F.W. blue spots (whitish in one example) are distinct in areas 2, 3, 5, and 6, being the most prominent markings on the wings except the submarginal white spots of the H.W., the only markings that are not blue in most specimens. The F.W. post-discal spots can generally be made out, although very faint. The blue band of the H.W. is more outwardly placed than in *carpenteri*, although very similar in its angulated direction: within it the H.W. as well as the basal third of the F.W. is a steely blue of great brilliancy in certain lights in some of the specimens. The females differ from *civilis* and many other female forms in the faint linear development or absence of red in the admarginal spots of the H.W., which are peacock blue (in one female pale grey), generally becoming olive green at the anal angle, but sometimes persisting unchanged. The upper surface markings are very elusive and very variable. Although developed to a much fainter degree they greatly resemble those of *carpenteri*, a form which could probably be easily derived from variable male-like females such as these.

Now that Mr. Swynnerton, Capt. Lamborn, Mr. Farquharson and the Rev. K. St. Aubyn Rogers (who in 1916 bred the ♂ and what is probably the ♀ form *a* of *ethalion* from a known ♀ parent of the same form, at Dabida) have shown that it is not difficult to rear these most interesting of all species of *Charaxes*, it is to be hoped that more will be done in breeding from known female forms in the same and other localities. It may perhaps be possible to pair in captivity and thoroughly test the Mendelian relationships.

BUTTERFLIES CAPTURED IN NATAL DURING THE EXTRAORDINARY RAINS OF 1917. —Prof. POULTON exhibited the specimens referred to in the following letter written by Mr. C. N. Barker in continuation of his notes in *Proc. Ent. Soc.*, 1918, p. xxviii. All had been taken in the neighbourhood of Durban.

“ Mar. 11, 1918. Durban.

“ I am sending you herewith a box containing a lot of this season's *Beleais severina*, Cr., which may perhaps interest

you, as showing some effects on butterflies of the abnormally wet weather experienced out here since the middle of June last. I am enclosing a monthly record of the rainfall. It has varied a great deal in localities only a few miles apart, as you will notice in the printed record for October, which I enclose. The four *Acraea petraea*, Boisdu., which I took on the 16th of June, just after a heavy fall of rain, show considerable signs of melanism. The dry-season forms had been in evidence for some time before the rains fell, and although there was the usual seasonal modification towards the dry forms, none of them throughout the winter took on the extreme dry phases. I went out the following and any available week-end, but after taking these four *petraea* found no more in evidence for a month or two after. In fact, they only began to come into evidence again in the full wet-season form at their usual time of appearance. I have been disappointed in not finding any extreme cases of melanism, but I think this may be due to the unusual coolness of the season, due to protracted rains. Moisture must be accompanied with heat to produce fullest results.

"The tattered *P. lycaeus*, Dbl., covered with fungoid growth I found feebly flying through the bush after heavy and protracted rains that fell in January 1917. I had a great chase after it, for the orange growth upon it gave it the appearance of being some strange exotic species. The *Pseudoraca tarquinia*, Trim., has been mutilated by some enemy. I should infer that it had been seized by one of the large Agama lizards which are very plentiful about our coast bush. The pair *in coitu* may also interest you."

The last-mentioned pair was a dry-season ♂ *in cop.* with a wet-season ♀ of *Byblia goetzius*, Herbst., taken Oct. 16, 1916. The *tarquinia* was an excellent example of symmetrical injury to the hind-wings. The orange powder plentifully covering the under surface of the hind-wings of *lycaeus* was found to be pollen by Dr. A. B. Rendle, F.R.S. The quantity was very remarkable, and nothing like it had been seen by any of the African naturalists to whom the specimen had been shown. Dr. Eltringham had compared the *petraea* with the Hope series from Natal, but considered that they did not

differ from the average of other years. Dr. Dixey had written the following note on the *Pierinae* :—

Pierinae captured at Durban, Natal, by C. N. Barker.

The dates of the captures are from July 7 to Dec. 2, 1917. Mr. Barker notes that the season was abnormally wet after mid-June.

The species are *Belinois gidica*, Godt., and *Belinois severina*, Cram.

B. gidica.—One specimen, Sept. 2; two specimens, Nov. 18 and Nov. 30 respectively. An early September example would generally be dry; this one is wet, though with a trace of the dry-season character about it. The November specimens are wet, as would be expected in ordinary seasons.

B. severina.—Four caught in July, two in August, one in September, five in November, one in December.

The July and August examples are of the full dry-season form, as they would be in ordinary seasons. The November and December examples have the wet-season ground-colour and the dry-season veining; this is a usual condition at this time of year in ordinary seasons. A similar condition was produced in 1905 by Dr. G. A. K. Marshall at Salisbury, Mashonaland, by exposing a brood of *B. severina*, which would normally have emerged as the dry-season phase, to artificial conditions of moisture throughout the larval and pupal stages (see Proc. Ent. Soc. Lond., 1907, p. xiii).

On the whole, the abnormal character of the season appears to have had little or no influence on these Pierines.

EX-GERMAN EAST AFRICAN BUTTERFLIES AND THEIR RELATION TO THE SEASONS.—Prof. POULTON said that he had received the following information, supplementing that communicated to the meeting of May 1st last (p. lviii), from the Rev. K. St. Aubyn Rogers at Kongwa :—

“ Feb. 28, 1918.

“ The wet season this year has been much less heavy than last year, and the ‘ break ’ has been much more pronounced. We had heavy rain in January (about 8½ in.) and the first

week in February, but the last three weeks have been dry and sunny and rather windy.

" I am sending you the little *Alaena* which occurs here. It is not uncommon, but very local, and I have only found it in the forest on the hills behind the house, which is completely deciduous in the dry season. I make a guess that it is *A. reticulata*, Butl. [It is *A. johanna*, E. M. Sharpe.] I am also sending a specimen of the *Belevois*, which cannot, I think, be separated from *B. picta*, Neave. [Dr. Dixey agrees with this opinion.] It is extremely variable here, and some specimens are much more like Neave's figure, and others much less like it.

" I took about eight males of the form of *Arraca acrita* I sent you in my last letter [*acrita ambiguus*, Trim.: Proc. Ent. Soc., 1918, p. lix, n.], and this week I have two females.

" Mar. 7, 1918.

" I have not yet seen Dr. Dixey's paper in which he described *Teracolus rogersi*, so I cannot be certain, but I believe I have specimens from these parts. It does not occur on the low ground, but well up on the hills, and is by no means common. [Dr. Dixey has found three ♂ examples of *rogersi* in Capt. Carpenter's collection from St. Michael's; see p. cli.] I am quite convinced that my specimens do not belong to any of the common orange-tipped species of *Teracolus*. Last Saturday I got another orange-tipped *Teracolus*, which puzzles me. On the upperside it looks like an extreme dry ♀ of *T. phleggus*, Butl., but the underside does not agree at all with the dry forms of this species I took last year. I captured a similar specimen on my way to Mamboya in February last year, but as it was much shattered, and I took it for a ♂ *T. phleggus*, I did not keep it.

" Though we have had a month's fine weather now all *Teracolus* and *Precis* are still ⊕, and we expect more rain any day. There have been some thunderstorms about lately, but we have not had any here.

" I enclose a small Lycaenid which I think must be *Alcides talasana*, Wallgrn. It is common here locally in the rains, and varies a great deal." A long series of the same form,

taken in the rains by Capt. Carpenter at Itigi, between Mar. 21 and Apr. 6, 1917, showed such marked variation that it seemed doubtful whether *takosama* was not the same species as Cramer's *pietas*. Structural investigations were required.

" Mar. 21, 1918.

" The rains have been very deficient this year except during January, and the crops will be very poor; in fact, unless rain comes soon there will be famine in some districts."

CAPT. G. D. H. CARPENTER'S FURTHER NOTES ON EX-GERMAN
EAST AFRICA, ALMOST EXCLUSIVELY EAST OF LAKE
TANGANYIKA.

Owing to the loss of letters from Capt. Carpenter between July 16 and Oct. 5, 1916, there is some inaccuracy in the account published in Proc. Ent. Soc., 1916, p. cxxviii. On July 16 he was at Namirembe Bay at the S.W. corner of Lake Victoria. In the first half of August he was at 32° 20' E., 3° 20' S., in a temporary camp in flat, dry country with thin, deciduous bush, arriving about the 18th at 32° 45' E., 3° 15' S., in the neighbourhood of St. Michael's Mission, in country of similar type with granite outcrops. This was the "place of rocks" (*ibid.*, cxxviii), where he remained until about the middle of October, reaching Muanza, the well-known port on the S. coast of Lake Victoria about Oct. 20. The following extracts, arranged regardless of date in what seemed the most convenient order, give some of the information recorded in the missing letters.

" Mar. 6, 1917.

" I gather from your saying that you didn't understand the allusion to 'the place of rocks' that a long and, if I may say so, an interesting letter * of mine has got lost—very probably it went down in the 'Persia,' which contained a large E. African mail. It described a camp at St. Michael's about half-way between Muanza and Tabora, among piled-up granite boulders which sheltered countless *Hyrax* (the first

* After reading Proc. Ent. Soc., 1916, p. cxxviii, Capt. Carpenter wrote on May 20, 1917: "At least two letters written between July 16 and Oct. 3, 1916, never reached you."

time I had met them) and Caracal cats (or rather Lynxes, I suppose) and interesting birds and lizards and things. I cannot now remember what I said, but it was probably written early in September or end of August, I think.

" Oct. 6, 1917.

" No, I fear I can't re-write the missing letters about St. Michael's: the enthusiasm of the time is gone!

" Aug. 9, 1917.

" What's coming may interest you. It got lost in a previous letter that didn't reach you. *Firstly*, about a Jumping Shrew (Macroscelid?), which I found, dead, on safari, about this time last year. I asked my boy the native name for it, for apparently they know it quite well and differentiate it from Rodents. In Kiswahili it is called Kasanji (or Kasangi): my own boy said it was crepuscular rather than nocturnal. A Muganda called it Musonso, and said it lives in very long burrows underground and ate white ants, but also said it ate the same as rats and mice (so there is probably confusion here). Both boys said this: that these (apparently feeble) animals entice mice to come to them by squealing, and then kill them, but do not eat them. My Swahili boy also said that two or three will collaborate in attacking a snake, or lie in ambush for it, and kill it: probably mere folk-lore!!

" Nov. 30, 1917.

" It was on July 5, 1916, at Namirembe Bay that I saw the first "Jumping Shrew." I saw three large ones here [at Lulanguru, 17 miles W. of Tabora] one evening, quite close. They did not actually jump, but their quick gait was much like that of a rabbit when it moves from one spot to another with powerful thrusts of the hind-legs. I was near enough to see how the absurd tubular noses were constantly wrinkled up. They sat on the ground with the tail straight out behind them."

Dr. Oldfield Thomas, F.R.S., to whom the description has been submitted, considers that the "Jumping Shrew" is no

doubt a member of the *Macroscelididae* and most probably an *Elephantulus*, but the genera are very closely allied.

" Aug. 9, 1917.

" Now about *ants*. I was talking about *Megaponera* to a C.M.S. missionary from Toro, and he said in that part of Uganda they are well known for their Termitivorous (?) habits. But he added this curious tale. There is another, 'small, red,' ant which the natives call 'Nabi,' and they say it comes into a house and eats all the Termites, but *doesn't go away until it has 'sown its mushrooms.'* I asked the missionary what he meant by that, and he said that the departure of this ant is followed by a crop of tiny fungi in the Termite runs. I can only explain it by some fungus which the Termites keep under restraint, flourishing rampantly in their absence. For the natives did not say that the 'Nabi' comes back to eat its mushrooms!!"

Having thus, as far as possible, filled up the gap in the series of letters published in Proc. Ent. Soc., 1916, the correspondence is continued in order of date—with here and there a passage inserted, for the sake of convenience, out of its chronological position. The last letter published in 1916 (p. cxxviii) is dated Oct. 5 of that year; the present series begins only a month later.

These letters, like the earlier ones, include many observations and descriptions that are not Entomological, but throw light on the interesting and little-known country in which the Entomological work was done and the unique conditions which now prevail.

Many of Capt. Carpenter's observations on mimicry are on the lines of Dr. Marshall's work published in our Transactions for 1902, but the species are nearly always different, and in such a difficult and controversial subject the independent testimony of another observer, who from the force of circumstance was unable to study the work of his predecessors, is of great value. Furthermore Capt. Carpenter has done far more than confirm; he has added new conclusions of much interest.

In the variety of inquiries involved in the study of Capt.

Carpenter's letters and material I have received kind help from the following friends : - Mr. H. E. Andrewes, Mr. G. J. Arrow, Mr. G. T. Bethune-Baker, Mr. K. G. Blair, Dr. G. A. Boulenger, F.R.S., Mr. G. E. Bryant, Dr. F. A. Dixey, F.R.S., Mr. J. H. Durrant, Dr. H. Eltringham, Dr. C. J. Gahan, Sir George Hampson, Dr. G. A. K. Marshall, the Rev. F. D. Morice, Mr. S. A. Neave, Lord Rothschild, F.R.S., Dr. Oldfield Thomas, F.R.S., and Mr. Rowland E. Turner.

" Nov. 3, 1916. *Ndala* (33° 15' E., 4° 45' S.).

" By this time you should have received a box of interesting specimens collected in the country between our start-off point at the N.W. tip of ex-G.E.A. and the S.W. corner of the lake.

" I forget when I last wrote, but since then my connection with the Belgian troops has come to an end, as when they had got to Tabora all the Uganda porters who had been loaned, to get them there, were recalled, and we all reached Muanza at the end of October. Muanza is as different from Entebbe as it can be. It is a place of granite rock which crops up everywhere, forming islets in the sound at the mouth of which Muanza lies, and hills of small size ashore. These are all grown with bushes, now bright green, and it all looks very pretty, but absolutely different from Entebbe with its forest growth, papyrus swamps, banana plantations, and flat-topped hills. Rice and millet are the crops at Muanza. I was only there two days, as I was ordered off at once to my present post along the Lines of Communication between Muanza and Tabora (200 miles out, which I did in a car in two days; it would otherwise have been a fortnight's safari). It is only 40 miles from Tabora, which I hope to see some day. There is *very* little to do here, and I have a much bigger staff to help me to do it than I ever had when we were on the march. It's rotten country, very very flat (extremely hot and dry, though all the trees are brilliant with young green, possibly because water is very near the surface), and with thin bush, and a great part of it has been cultivated at one time or another, so that it's pretty hopeless for butterflies. When I have read my last batch of papers and finished my Xmas letters I shall have very little to do

except think about the treasures I *have* caught, and wonder when I shall have a chance of working them up. At one time I thought I *might* be coming home this winter, but they are not letting any doctor men home on leave.

"I hope I shan't be kept here long. I am now nowhere near any kind of 'front.' All the future fighting will be in the S.E. part of the country, south of the railway, which is now entirely in the hands of the allies and being used by us.

"Dec. 14, 1916. *Ndola*.

"Yes, I had thought that the smaller yellow, orange-tipped Pierine [*Teracolus incertus*, Butl.] might be associated with *Eronia leda*, Boisd.

"I went about 150 miles along the 'Central Railway' to a case of Blackwater Fever, about a week ago and have only just got back. I was glad to see the railway (which is, naturally, of great use to us now). It seems to have been built 'regardless,' and everything is most solid and expensive. Every little station (about 10 miles apart) has a stone and concrete building. But what the stations are *for* no one can tell: they are just islands in the midst of most hopeless thick bush—mile after mile of it—and it's the most extraordinary contrast between a journey on this line and one on the Uganda Railway. There *are* giraffe and a few big antelope and lions, but I saw none of them. The bush can't even produce butterflies! I am sending to Wiggins a small box of sundry insects and asking him to forward it to you. I hope the few butterflies may be of interest: perhaps the skipper that frequents ant-bear holes may be so, also a Liptenine [*Teriomima pallida*, Trim.] which looked like a *J* Lymantrid (e. g. 'Vapourer') on the wing." The species of *Sarangesa* mentioned in Proc. Ent. Soc., 1916, pp. cxxix, cxxx, were included in this box. Two *S. pertusa*, Mab. and 4 *S. sygestalmenus*, Karsch, were labelled "In ant-bear hole; noon, July 23, 1916," at Namirembe Bay, S.W. Victoria Nyanza, and 1 *sygestalmenus* "In ant-bear hole, noon, 32° 20' E., 3° 20' S." Capt. Carpenter was in a temporary camp at this locality and the date was Aug. 8-11, 1916. A little earlier on Aug. 1, at 32° E., 3° S., he found a male of

the remarkable Liptenine *Epilote miranda*, Staud., floating dead and headless on a forest pool—a noteworthy extension of the range of this species.

“ Jan. 3, 1917. Ndala.

“ You will see that I have hitherto had no chance of replying to the late Colonel Manders’ remarks on my *Pseudacraea*s in Proc. Ent. Soc., 1915, p. xxiii. so I am writing something here.

“ Firstly—the *bird question*. I certainly do not agree that ‘the bird population on the mainland and on Bagalla is practically the same.’ One striking exception at once leaps to my mind:—the extraordinarily greater abundance of Flycatchers, of two types, on Bagalla. The most noticeable of the two is the one I called ‘Kunguvu’ in my Report on *Glossina*. I think it must be a *Terpsiphone* [considered by the authorities of the Natural History Museum to be *T. cristata*, Gmel.]. It is red-brown with blue-black head, and the cock has very long floating white tail plumes. This is immensely more abundant on the islands than at Entebbe on the mainland, and its ringing call was the first bird note in the forests at daybreak, so that I soon got very familiar with it. When, in 1914, I visited other islands, I noted that the call varied in pitch very slightly from that of the Bagalla birds, and thus one is almost forced to conclude that some islands have their own *race* of this bird, and that they do not cross from mainland to islands. They are retiring birds, are not seen in the open, and have the typical Flycatcher habits.

“ The other of the two is a black and white species [*Phlogothra jacksoni*, Sharpe, according to the Natural History Museum and Mr. S. A. Neave] with red fleshy protuberance over the eye. Its call, totally different from the other’s. I also have deeply rooted in my memory, and learnt to whistle it and make the bird answer. I think this bird also was more abundant on the islands than at Entebbe. In 1914 I noticed that the call of the birds on the group of islands I was then working on was different in pitch—though really the same call—from that of the Bagalla birds.

"Again—one striking feature—I never saw a Drongo on the islands. I should think they must live on the mainland round Entebbe, but have not seen one, though I have not done any work on the mainland. [Mr. Neave does not remember whether he saw Drongos at Entebbe, but thinks the locality unlikely for the common species.]

"As regards the passage to and fro of birds from mainland to islands, Col. Manders appears to think that such a passage must be an objection to my explanation. But why should it be? A bird passing across 25 miles or so of water carries with it the memories of its last hunting-ground, surely? I know that Bee-eaters fly over wide stretches of water, as I have seen them when canoeing.

"Now Col. Manders thinks my table in the Sleeping Sickness Reports shows that birds do not eat butterflies. Surely this is hardly justifiable. Firstly, I was not searching for evidence as to what birds eat, but only as to whether they ate *Glossina*; i. e. I was looking for one specific object—the tsetse fly's wings: so any piece of a butterfly that was not grossly obvious would have been likely to be passed over; for I used only a low-power dissecting microscope and not one high enough to distinguish Lepidopterous scales, which, as Swynnerton has shown so admirably, is absolutely necessary. One could deduce equally well from my table that birds do not eat Diptera!

"Col. Manders makes some large assumptions. On the evidence of 116 birds he says 'we may assume that none [i. e. no tasting experiments] took place.'

"He talks about 'aposematic crimson and blue bodies of Dragonflies.' On what evidence does he call them 'aposematic'? Surely a *sine qua non* of an aposematic insect is a method of display by slow gait, feeble flight, sluggishness, etc. Are any of these characteristics of Dragonflies? There is, one would think, much more ground for ascribing these colours to sexual selection (if this hypothesis holds good at all), seeing that the males are often so much more gaudy than the females.

"Lastly, a propos of his quotation from Fabre, was not that great observer's objection to the mimetic explanation of

the colours of *Volucella inanis*, L., due to the supposition—in those days, before its habits were fully known—that its appearance protected it from the wrath of the wasps in whose nests it was supposed to be *parasitic*? I understand that now it is known to be *beneficial* in the nest rather than otherwise, the larva feeding on débris. But surely the modern view is not that *Volucella* needs to be protected against the wasp, but against birds that fear the wasp. [See Trans. Ent. Soc. Lond., 1904, pp. 661–665.]

“I had the rottenest, dullest Xmas I’ve ever had. There was nothing to read of any kind. I have said before what a rotten place this is for butterflies, and no Xmas fare, indeed even rations very poor. We have now no jam, sugar, lamp-oil (but candles *for the present*), or soap issuable! No vegetables for weeks! However, one can get eggs and mangoes abundantly, and milk, and I have some porridge and syrup which helps out. It’s funny what one *can* live on day after day the same. Breakfast is the best meal—porridge with syrup and milk, bacon and eggs, bread and jam (just finishing now). Bread, soup, meat and mangoes form other meals. Luckily I have had some butter, which helps, but it is nearly finished now!

“We are very isolated—three days from Tabora (where one cannot get anything) and three weeks from Muanza. An occasional motor-car, which usually breaks down en route to Muanza, brings up the belated mails. A parcel of ‘goodies’ which my mother sent for mid-October in *August* is still trying to get to me! Well, that’s *another* long grouse!

“Jan. 14, 1917. Ndala.

“I am taking the opportunity of a friend going back to Muanza and Entebbe (from here Ndala, where I still am—35° 15′ E. and 4° 45′ S.) to give him a box of ‘dudus’ for Wiggins to post for me at Entebbe. You may label them Ndala (for it appears on the map, being a Mission Station), with latitude and longitude as above. A few I got recently on a very enjoyable safari (except for *G. morsitans*!) in the neighbourhood. It was quite a joy ride, and I had no respon-

sibilities. It was nice to be able to go as one pleased with just one's own kit. We had (I went with the Political Officer) very fine sunny weather, but now the rains have just begun, and go on until about June or end of May. They say that now it means we can't finish off the boches (who are around Mahenge) until August, as the country is impossible in the rains down there.

"Well, now, I will look through my journal for notes on any of the insects I send—they are not all butterflies: some are Asilids with prey.

"To begin with—a Millipede, a giant black species about 6 inches long, I should think, brown-legged, really very handsome. On Dec. 26, before breakfast, I saw one walking along, and I picked it up. Millipedes when picked up coil up in a ring and 'lie low,' but this didn't. He was of an original temperament, for he wriggled violently, and when I dropped him, lay on his back and *writhed in such a serpentine manner*—actually making progress thus—that it was quite terrifying! Subsequently, as he walked along, I irritated him with my stick, and he *turned over on his back* and writhed again in serpentine manner. I doubt if any native who was not familiar with these common creatures would have gone near it. I was much interested because I have seen and handled a great many of these handsome armour-clads (they were *very* abundant on the islands, though I think this was the biggest I have seen), and since then have tried to make others of the same size and appearance perform in the same manner on *three* occasions, but I have never met with another performer. Perchance, in half-light, it *might* save one from being eaten. *Some* animal does eat them, I fancy perhaps jackal or mongoose, for one finds their rings in old dried-up droppings."

[Capt. Carpenter wrote in a letter of June 20, 1917: "Re the Millipede—I fancy it writhed on its *back* because the movements were so lusty that the delicate legs might have interfered with the freedom of the movement or even been damaged by it. I tried several others of the same species afterwards, but never got another individual to writhe in the same serpentine manner."]

On Dec. 28th I got a beautiful Mutilloid spider. I was collecting on a road through the bush and picked up several Mutillids. But one turned out on closer investigation to be the spider which I send in a tube with the *Mutilla* it resembles, taken at same time and place. It used its fore-legs to mimic the antennae of the *Mutilla*, just as does a spider mimicking an ant. Its manner of movement was altogether Mutilloid, and its colours exactly (during life) matched the dull red and black of the *Mutilla*. I wonder if Mutilloid spiders have been described before?"

The specimens in the tube are accompanied by a corresponding note which also states that the "colours exactly matched." The *Mutilla* appears to be the same as a ♀ taken, Dec. 1903, *in cop.* with a very different ♂, by Dr. Marshall at Bulawayo, and named by the late Col. Bingham *M. characus*, sm. Mr. A. W. Picard-Cambridge considers that the spider belongs to *Prothesima* (*Drassidae*) or a closely allied genus, and that the species is near *P. albomaculata*, O. Pick.-Camb., taken by Dr. Marshall as a Mutilloid mimic, at Salisbury, Mashonaland (1898-99). See Trans. Ent. Soc., 1902, p. 511; Proc. Zool. Soc., 1901, p. 11, pl. v. figs. 2-2c.

Capt. Carpenter took the same species of spider later at Lulunguru (see p. cxxxv). At this locality and at Ndala he also observed and captured several examples of black, white-marked *Carabidae* together with their Cicindelid mimics. All the species are different from those observed and figured by Dr. Marshall in Trans. Ent. Soc., 1902, pp. 511-515, and pl. xvii, and some of them appear to be undescribed. Capt. Carpenter did not comment upon the general Mutilloid effect of the black-and-white pattern during rapid movement. Dr. Marshall (*ibid.*, pp. 511, 512) points out that it is this part of the Mutillid pattern and not the red thorax which attracts attention in life.

Capt. Carpenter's captures of members of this association are as follows. On Dec. 18, 1916, at Ndala, the Mutilloid Carabid *Piezia* sp. was, together with its Cicindelid mimic *Dromica* (*Myrmecoptera*) *erikssoni*, Horn, "Taken on a road, almost in the same spot." The mimic bears the note "This does not fly as readily as many Cicindelids." Then, at the

same place, on Dec. 20, and again on Dec. 21, another Mutilloid Carabid *Polyhirma* sp. was captured with its mimic *Dromica* (*Myrmecoptera*) *neumanni*, Kollar. The pair of Dec. 21 bear the note "Taken on same stretch of road." About a year later, on Nov. 20, 1917, at Lulanguru, a large species of *Polyhirma*, and in this case with the black-and-white Mutilloid pattern more sharply and clearly expressed in spite of its disproportionate size, was taken with its mimic *Dromica purpurea*, Bates, and two examples of *Dromica* sp., the mimic of a smaller Mutilloid *Polyhirma* taken the day before. The mimetic associations between the beetles are suggested on the accompanying labels, including the probably synapomorphic relationship between the two Carabid models. In all these *Polyhirmas*, except the largest species, the Mutilloid black and white is dullly expressed, as also in the mimics, while in the mimic of the largest species it is evanescent.

The splendid Mutilloid mimic, the Carabid, *Eccoptycten cupricollis*, Chd., which caused Dr. Marshall "to hesitate more than once before venturing to handle it" (*ibid.*, p. 512, pl. xvii, fig. 11), also deceived Capt. Carpenter, for his note on a specimen of Dec. 8, 1915, on the bank of the Kagera River, near Ngarama, about 37 miles W. of the Victoria Nyanza, is: "Mutilloid! Quite took me in," and again "very Mutilloid" on a Ndala specimen of Dec. 16, 1916. The female of *Bolichomutilla guineensis*, F., a very perfect model, except that its thorax is black instead of the reddish colour so common in *Mutillidae*, was taken at Ndala a few weeks before, on Nov. 13.

"About at the beginning of December we had a burst of rain which left large puddles on the dry roads. Almost immediately after one saw *Crabs* running about! It seemed strange to see them away from any large body of water, though there are permanent water-holes. A large puddle which I had noticed to have been frequented by crabs on Dec. 13th—at which time it had been just formed—was, on Jan. 3rd, reduced to a mere cupful of water, in which I found a young crab, very minute. Its metamorphosis cannot take very long, for on Dec. 2nd the puddle had not been formed.

It was probably formed about the 10th. This residue of the puddle was a wriggling mass of tadpoles and *small fish*! How did the eggs get there?!"

[Dr. G. A. Boulenger, F.R.S., kindly writes: "I have often heard before of water-holes in Africa being filled after months of drought and then at once alive with fish, which must have been aestivating in the ground, probably at a considerable depth, where there was just enough moisture to keep them alive. The tadpoles are easily accounted for, as frogs breed at once after rain, their eggs hatch in a couple of days, and the success of their brood depends only on how long water, or at least moisture, will remain to allow the young to complete their metamorphosis."]

"On Dec. 30th I got two Asilids with prey, one a winged ♂ black ant, the other a typically aposematic black and scarlet *Hemipteron* (I think a Reduviid). It was *alive* and unfortunately escaped. That it was *not dead* seems to be another instance of the well-known hardihood and retention of life of aposematic insects in general. I feel sure Asilids must *inject* some poison into their prey when they first thrust the proboscis in, for I have watched one catch an insect and immediately caught them both and found the prey (even a vigorous insect, a Cicindelid, for instance) as collapsed as if it had been stung by a Fossor. [Kirby and Spence (5th ed., 1828, vol. i, p. 274) speak of the instantaneous death of the prey: the injection of poison is suggested in Trans. Ent. Soc., 1906, p. 365, footnote.] On this same date I got a small black and yellow predatory wasp [the Fossor (*Sphegulae*) *Palarus latifrons*, Kohl, allied to *Astata* and *Crabro*] carrying a stung honey-bee [*Apis mellifica*, L., var. *adansonii*, Latr.] -- heavier than itself. I send both."

The observations on *Anomophila beninensis*, Pal. de Beauv. (*lugubris*, Gerst., see p. cxxxvi), made on Jan. 3, are published in Proc. Ent. Soc., 1917, p. xlii.

"On Jan. 4th I saw, about 7.30 a.m., large numbers of winged *Termites* belonging to a very minute species [*Eutermes* sp.] emerging from holes in the ground, on a cleared track. As fast as they came out they huddled together, each one's head beneath the folded wings of the one in front, so that all one

saw was a mass of wings, those of each Termite overlapping another's, so that the appearance reminded one of a piece of butterfly's wing seen under a microscope. They made no attempt to fly away. After a while the mass began to elongate in two directions, and two long lines, headed by workers and soldiers, began to move away. But the Termites very soon stopped and hunched together again. What a meal for a Wagtail had there been one there. This species of Termite comes to light in the evening in a very annoying way. I send you some of them.

" On Jan. 5th I found under bark of a dead tree a small Carabid [*Thyreoporus flavosignatus*, Dej.] and several large Erotylids [*Mimodacne grandipennis*, Fairm.], both species of the same colour scheme—black, with two orange transverse bars. By a very curious coincidence, only the night before some insectivorous animal had been in my hut, and left a dropping behind it in which I found an elytron of this Erotylid, and wondered what beetle it was, as I had not hitherto met with it. The Carabid is a small one, and the other so very much larger that it is difficult to believe that mimicry is at the bottom of the resemblance (unless the Erotylid is distasteful and the Carabid a synaposeme).

" On Jan. 9th I caught a very remarkable-looking large black fly with conspicuous red head. I caught it on the wing—it flew very slowly and settled conspicuously on a leaf. I send it you—I cannot place it at all."

The fly is *Bromophila caffra*, Macq., figured as one of a Rhodesian group of insects in Trans. Ent. Soc., 1902, pl. xxiii. fig. 27. Dr. Marshall speaks, on p. 531, of its abundance and sluggishness, and states that "it ejects a yellow liquid from the mouth when handled, and was refused when offered to my baboons and *Cercopithecus* monkey."

" On Jan. 7th I got a very fine large black Carabid [*Anthia formosini*, Bert.] with dull white margin to elytra, running over bare ground in moonlight. As it is a common type of colouring I picked it up to see if it was the most common species, and saw it was one I had not yet seen: I send it to you. I was looking at it by full moonlight, holding it about 18 inches away from my face. The fluid which it

ejected hit my left eyebrow and caused immediately a very severe burning sensation, and though I at once bathed the place in water, the burning sensation did not fully pass off for half an hour. [The defensive secretion of the *Anthias* is also treated of in Dr. Marshall's memoir: see especially pp. 510, 511.] I may here say that my monkey, when I put down one of the commonest of this type of beetle, showed every sign of fear and actually ran away from it.

"On Jan. 10 a number of handsome black-and-white bees [*Anthophora nubica*, Lep.] were seen apparently roosting for the night all together on bare twigs of a large *Tamarind* tree. I send you a few. I had not met them before. On the same day I first saw the large and curious Lyceids, some of which I send [*Lyceus (Chlamypholycus)* sp. nr. *trichatus*, Guér.; the same as species 5 taken at Itigi. Proc. Ent. Soc. 1917, p. lviii]. The male has enormously expanded elytra. (My monkey won't have anything to do with Lyceids! This will appear later when I send you my account of 'Taste Experiments'.)

"I think that's all for the present. I am going off to-morrow perhaps to be permanently there to Igalula, the nearest station on the railway--about 40 miles E. of Tabora, where there is a recruiting depot for King's African Rifles and porters. I have to examine recruits, but whether I am coming back to Ndala I know not. I am taking the monkey with me, so hope to carry on. I have got records for nearly 100 species now.

"Jan. 18, 1917. *Igalula*.

"I arrived at Igalula to-day, but as there is *not* here the recruiting depot which I understood *was*, I shall presumably have to move further down the line to Itigi--about 150 miles E. of Tabora."

Capt. Carpenter's observations on a *Bombex* attacking Hesperid butterflies (Proc. Ent. Soc., 1917, p. xli) were included in this letter. Other specimens also captured on the journey, Jan. 17, from Ndala to Igalula are referred to in the following letter.

" Mar. 12, 1917. Itigi (34° 30' E., 5° 45' S.,
4273 ft., on the Central Railway, about 150
miles E. of Tabora.

" On Jan. 17th I got a fine large *Pierine* [*Teracolus ducissa*, Dogn., ♂] new to me, the Belenoid Hesperid mentioned before, a fine rosy *Acraea* [*A. acrita ambigua*, Trim., ♂], only once, I think, caught hitherto, and some other Hesperids new to me." One of these, *Oxypalpus harona*, Westw. is mentioned in the extract quoted in Proc. Ent. Soc., 1917, p. xli, together with the " Belenoid Hesperid," *Leucochitonaea hindei*, H. H. Druce. The following interesting note on this latter species accompanied the specimens:

" Jan. 18, 1917. *Black and white Hesperid*.—The first I saw, on road through 'Xerophilous forest,' sitting on patch of wet mud with wings outspread. I thought it was a *Belenis* new to me, until I got within striking distance and saw its short antennae out in front of it. (N.B.—I at first thought it rather a curious attitude for a *Pierine*!) Subsequently caught others, most with wings closed in *Pierine* attitude. One was closely associated with the two *Belenis* [*B. gidica*, Godt., ♂, and *B. scerina*, Cr., ♂] sent with it. I watched them several times. The Hesperid would settle and the *Pierines* come and settle as close as possible to it: some *Catopsilia* also—a pale green species like a ♀ Brimstone [evidently *C. florella*, F., ♂]. I failed to catch all three at one stroke of the net, but caught Hesperid and one, and the other (the identical one which had been drinking with the Hesperid) a few minutes later. When the net is put down over them the Hesperid does not at once fly up with the *Pierines*, but remains calmly sitting. Curiously enough, the first one I saw was the only one that had wings outspread. Its flight is not so dashing and irregular as most Hesperids: indeed one *might* say (but I *won't*, for fear it's only imagination!) that its typical Hesperid flight has become *Pierine*! But I don't think the flight is sufficiently *Pierine* to cause the butterfly to be mistaken for a *Pierine on the wing*: there is still a certain Hesperid touch about it."

The resemblance of the allied white, black-marked Hesperid, *Abantis lerubu*, Wallgr., to the commonest *Pierines* at Taveta.

was pointed out by the Rev. K. St. Aubyn Rogers in Trans. Ent. Soc., 1908, p. 540. The following specimens captured at Taveta, on May 10, 1905, by Mr. Rogers are in the bionomic series of the Hope Department:—*B. severina*, ♀; *Teracolus holacede*, Klug, ♀; *T. celimene*, Lucas, ♀, and *A. leruba*, ♂. Mr. Rogers considers that at Taveta *B. mesentina* forms, with *severina*, a centre for the convergence of other Pierines, and he writes of the above list, to which *mesentina* might be added, "all these species bear a considerable resemblance on the wing, and all settle in exactly the same way with wings half raised. I think *Teracolus castalis*, Staud., might be added to the assemblage. . . . The Hesperid is of great interest, as mimicry in this group is so rare. The species has a rapid flight as is usual in this family, but its comparatively large size and its conspicuous black-and-white colouring mark it out at once from its congeners and give it a strong superficial resemblance to the forms mentioned above" (*ibid.*, p. 540).

The specimens captured at mud on Jan. 18, 1917, may be compared with 18 male Pierines settled on a patch of cowdung and all under the net together, on Aug. 25 at Itigi in the dry season (from about May 25):—8 *Belenois mesentina*, Cr., 5 *B. severina*, Cr., 2 *Pinacopteryx simana*, Hopfl., 1 *Teracolus eris*, Klug, 1 *Herpasaenia eriphia*, Godt., 1 *Glutophrissa eriphia*, Cr.

Returning to the letter of March 12:—

"On Jan. 29 I got two Lycaenids new to me, I think [*Epanera aphareoides*, Trim., and *Angiolius silanus*, H. H. Druce]. Also on Feb. 5. one do. do. [*Castalius hintza*, Trim.].

"*Pinacopteryx simana* is very abundant at Itigi [see Dr. F. A. Dixey in Trans. Ent. Soc., 1918, p. 191]. By the way, the Mud-drinker's aposeme is scarce hereabouts, and I think there are only *Mylothris agathina*, Cr. (commonest), and one *Phorissura*. [In relation to this subject Capt. Carpenter wrote on Nov. 2, 1917. of the Lycaenid *Phylarta cyara*, Hew., "I have never seen it except drinking at mud." See Proc. Ent. Soc., 1915, pp. lxvi, lxxi, lxxvi-lxxix.] *Belenois* is not common; indeed *Teracoli* are the most abundant; but even now Itigi is a poor place for butterflies.

" Feb. 26, 1917. *Igi.*

" Things drag on here and we are all very sick of the business. But there seems no chance of rounding up the Huns that remain until the rains are *well* over and the marshes have dried up a bit. So for several more months I suppose I shall continue to vaccinate porters, and treat those that are sick, etc., etc. So do we win the war!

" Mar. 6, 1917. *Igi.*

" I was much interested in your phrase that 'the African vegetation *anticipates* the wet season.' Though I had noticed the facts the full meaning had not come to me, and the word 'anticipates' brings it home.

" Mar. 24, 1917. *Igi.*"

This letter contained the account of the 272 Lycid beetles caught on one plant, Mar. 23 (Proc. Ent. Soc., 1917, p. lvii) also the following note: "I caught my first *A. zetes acara* for many months, here, to-day. It was a very E. specimen as one would expect." An undated letter, written a little later, refers to the same species as follows: "By the way, I have at last caught a couple of *zetes acara* here, and both were, as would be expected, the most Eastern I have seen. But it is extraordinarily scarce." Of the powerful combination of large red-and-black Eastern Acraeas Capt. Carpenter caught in 1917, *zetes acara*, Hew., *pseudolyca astrigera*, Batl. and *anemosa*, Hew. They are very much alike, especially the first two, and Capt. Carpenter, who was unfamiliar with the species, speaks of them all as *zetes acara*. *A. natalica* Boisd., the commonest of the combination in British East Africa (see the Rev. K. St. Aubyn Rogers in Trans. Ent. Soc., 1908, p. 525), and *egypti areca*, Mab., are not represented in this ex-German E. African collection. Capt. Carpenter had taken *acara* and *astrigera* more recently than he supposed, the first on Feb. 7, as well as Mar. 28, the second on Jan. 9 and 10 (2), and Mar. 14.

" There have been lots of a Tabanid here with proboscis about half-way between *Pargonia* and *Tabanus*, and I have

caught a fine *Pangonia* [the ♂ of a very striking new species] feeding, hovering on the wing like a Bombylid, from a Composite flower. The specimen will be sent you: I think it's not the same as the one which bit me" (Proc. Ent. Soc., 1916, p. lxxxii). Another *Pangonia* caught about the same time is *P. distincta*, Ricardo, ♀.

" May 27, 1917. Itigi.

" The operations in pursuit of a very elusive German force in the neighbourhood are still in full swing. Some of the 'W.A.F.F.s' passed through here yesterday, and I saw a Hansa for the first time. The commander of the force has been taken prisoner, sick, but we have not had much success so far, and the force still continues to run about, and gets lost, and causes a lot of trouble. They cut our telegraph wire this morning, and it is said they have put bombs on the railway! I am much less busy now, as (following the usual custom!) quite a large staff has been sent up here, now that the work is about half what I had to cope with without qualified assistance a little while ago. So I have been able to get out for a bit, but we are now having very fine dry and (in early morning) cold weather, which is bad for butterflies. I am quite fit and enjoy the cold mornings.

" *Pangonia* is very common now, and I have caught numbers of males. They often hover in the air *exactly* like Syrphids (save that their long rostra are conspicuous), and (with females sometimes) may be found on flowers. I caught one male on a patch of white Labiate flowers, visiting flower after flower, and putting his proboscis down each tube like a bee! There was a very curious Tabanid here a little while ago, with proboscis relatively about as long as that of *Glossina*, a large blue-black fellow, with wings marked with bright brown, who never made any attempt to bite, but was only found on flowers or hovering in the air. [This is the new *Pangonia* feeding from a Composite flower, *c. supra*. Three females of another interesting Tabanid (*Pangoniinae*), *Dorsalaemus compactus*, Aust., taken Mar. 28, bore the note that when flying their appearance and sound were very bee-like.]

" June 20, 1917. *Itigi*.

" We are having very cold nights now—quite delightful. I pile on all my bedclothes at night and even then feel cold in early morning. I believe we are about 5000 ft. up here! [4278·2 feet.]

" The party of Germans who were in the neighbourhood are still uncaught, and leading us no end of a dance!

" I have been rather busy lately, as I have Smallpox to deal with (as well as the usual Dysentery, Pneumonia and Meningitis—I've got about 160 natives in hospital), and so have been vaccinating and revaccinating all and sundry, having to make a house-to-house visitation of the village near here. Up to date not quite 20 cases—two (haemorrhagic) died.

" July 9, 1917. *Itigi*.

" Still fine dry weather with cold nights.

" Continuing on Smallpox, I had 19 cases, 9 of which died, one of them vaccinated and with a few pock marks on his face from childhood. It seems to have been a very virulent form. The last man to develop it was only vaccinated 5 months ago—true, he did not get very large marks. What with Smallpox and Meningitis I've seen quite a lot of the more interesting diseases. There is still Plague which I haven't met yet!

" I am now rearing some Pierines from eggs, and have got an egg from *Pinacopteryx sinana*, which is nice, as I presume the larva must be undescribed, it having been so rare till now that I have found it so abundant here. It has a well-marked 'dry' form characterised by general suffusion with brownish grey scales beneath, so that resting among dry grass it is very procrptic (as are other dry forms). Indeed I think the explanation of the colours and shapes of dry *Preis* as being procrptic receives great support from the marked procrptism of dry Pierines, *Teracolus*, for instance: the pink or brown suffusion of the lower surfaces makes *Teracolus* very hard to see among the pinks and browns of dry grass, when the wings are closed.

"Aug. 9, 1917. Itigi.

'I've got the cameelious hump to-night, so please be patient and bear with me! The deadly monotony of this place palls: I have only about 100 patients in hospital now, and very few come to out-patients, so that, after my round before breakfast and about 2 hours more after it, there is no other medical work until the evening round—except some days when I get some men to vaccinate, and then I do them at the rate of 150 per hour, so they don't last long! Very different from the rather too strenuous times of a few months ago when, except for very hurried breakfast and lunch-tea, I was rushed from 7 a.m. to 7 or later p.m.! If only this were Kakindu, and I could feel I was doing good insect work! Now in the very dry time there is even less in the way of Lepidoptera than ever—a few Pierines and occasionally a Lycaenid or Skipper—so that one hardly feels it is worth going out. However, I *do* go out in the afternoons (or else I would fall asleep!), and to-day and yesterday got three specimens of a nice Lycaenid [*Rapala caerulea*, H. H. Bruce, ♂], on a flowering shrub, which was new to me and cheered me up!

About a fortnight ago I had a very welcome change, as I was sent away to a place called Lulanguru, about 17 miles W. of Tabora, where one got back to the country of granite kopjes and away from this infernal flat uninteresting bush. There I found one or two species new to me—some fine purple-tipped Pierines [*Teracolus regina*, Trim., ♂ ♀; also *T. ducissa*, Dogn., ♂ ♀], a Satyrine [*Henotesia simonsi*, Butl.], a beautiful Lycaenid [probably the ♂ *Dewlorix dinochares*, H. Gr.-Sm., see p. cxxxii], and, best of all, though not new, I got four more *Crenidomimas*, which I haven't seen at Itigi. So far as I could see they were the same as the ones I sent you before. They came from the same kind of country, and were also model-less! [see p. cxiii]. It was also rather nice to get away from the eternal (and infernal!) noisy railway engines of this place. There is always one blowing off or making a nuisance of itself in some way! Fancy being

worried with the noise of engines in the heart of Africa! Well, well.

"Well, that's enough. I feel better now, thank you!"

"Aug. 21, 1917. *Higi.*

"Very little to do nowadays here. I think there is every likelihood of this depot being closed, in which case I should be moved somewhere else. I hope it will be somewhere as far away and as different as possible from this dull, flat, dried-up bush country as possible. I am *very* bored with it.

"Aug. 22, 1917. *Higi.*

"I keep collecting *P. sinana* on account of its being so rare in collections: you may be able to use them for exchange. I should like some to go to the B.M. Also I keep on collecting other, commoner, Pierines (except the ones I know to be universal), as they are now in the dry phase. There is one very fine large *Belinois* [*B. gidien*, Godt.] of which I only knew the dry form with underside well suffused with grey and brown scales. [The wet form was taken at Higi on Mar. 21, and 2 intermediates on Aug. 25.] It is more agile and difficult to catch than any Pierine I know, which is saying a good deal! I first saw it at St. Michael's in September of last year, and have never seen it since (*i.e.* never during the *wet* season) until I got a fine pair *in cop.* on Aug. 18th, and since then have seen several others. I wonder if it only appears in dry weather?

"On June 27 three of a handsome Lycaenid new to me [*Stugeta boukeri*, Trim., or very near this species], and on June 28 and again on 29 a very lovely orange-pink *Aerona* also new to me [*A. acrita acrita*, Hew., with reduced black at the apex of fore-wing].

"On July 5 a very dead-leaf tailed brown Nymphaline new to me. It flitted from bush to bush, taking especial care to settle on or near clusters of wrinkled dead leaves. [A ♀ of *Charaxes neanthes*, Hew., 1854, the dry-season form of *zoolina*, Westw., 1850. This form was also taken at Iulanguru on July 24, Nov. 4 and 13, one of the specimens being noted as "scarce." The wet form *zoolina* was cap-

tured at mud, 4 examples on Jan. 7. near Ndala (32° 45' E., 2° 15' S.), and 1 on Jan. 18 between Ndala and Igahula (33° 15' E., 4° 50' S.). The Pierine-like appearance of the upper surface pattern of the wet form is specially noted by [Capt. Carpenter.]

" On Aug. 8 another Lycaenid [*Rapala caerulea*, H. H. Druce, ♂] new to me, with a patch of purple suffusion in middle of blue. Several more since then.

" I found, dead, one evening, a lovely little Rodent which I can't place in my memory. I think it must have been a Dormouse. Its head was rather rounded: it had mole-grey fur, paler beneath, but its tail was plumose like a little squirrel—grey, tipped with white. It was about the size of our Dormouse." Dr. Oldfield Thomas, F.R.S., writes that the Rodent " would appear to be an African Dormouse—*Graphiurus*—of which many species are found all over the continent."

" Sept. 3, 1917. Itigi.

" It's as dry as a bone everywhere, and except Pierines there are no insects about. I have been *much* interested to meet a dry season. I should not have believed there could be such a difference so near the equator. It's every bit as marked, regarding insect life, as our English summer and winter.

" Sept. 18, 1917. Itigi.

" Well, I'm still awaiting news about my leave being granted. I am very much afraid that as the end seems to be very near now, I may get caught in the process of clearing up, which will be a lengthy business! I should think in the end it will prove to be quicker to safari bark from Tabora to Muanza and go across the lake to Entebbe, rather than to go down to Dar es Salaam, where one might have to wait long for a boat to Mombasa!

" Oct. 6, 1917. Itigi.

" Insect life is still very scarce. We are nearing the end of the drought, and I am watching with interest the sprouting of bushes, etc., though we haven't had a *drop* of rain to

stimulate them. As regards *Acraea caldarena* f. *net-ska*, Oberth., you will, I hope, by this time have received a box that contained some more of it and other butterflies. [This refers to a rare form of *caldarena*, Hew., used in taste experiments with monkeys at Ndala in Jan. 1917. Unfortunately it did not appear in the later collections, but an *Acraea* taken at St. Michael's, Aug. 21, 1916, may be proved by structural investigation to belong to this form.]

"I've been trying to catch some Hymenoptera (as there's nothing else) for the Bureau, on Acacia flowers, and got to-day for you a beautiful Hymenopteroid fly [a species of the Syrphid genus *Ceria* (*Ceroides*) very near to *gambiana*, Saund.]—brown and yellow with petiolated abdomen, and wings longitudinally folded as in *Diploptera* which I have never seen before. But the posterior half was folded upwards, so as to lie *on top* of the darkened anterior half; the narrow strips thus produced were held as a wasp holds them, so the resemblance to a wasp of the type of *Belonogaster* was much accentuated. [See also Dr. G. A. K. Marshall in Trans. Ent. Soc., 1902, p. 534, and pl. xxiii, figs. 40, 41; also Dr. G. B. Longstaff in "Butterfly-hunting in Many Lands," pp. 392, 393, pl. iv, figs. 1-10.] I also got there 3 lovely *A. zetes acara*, typically *Eastern*: the E. form is even lovelier than the island forms, and these were very fresh. [In the first half of Oct. at Itigi 12 *acara* and 6 *astrigera* were taken.]

"Oct. 21, 1917. *Lulanguru* (3766 ft.), on Central Railway, 17 m. W. of Tabora.

"Since I last wrote I have been moved to a place where I really can be of use and am not wasted as I was at Itigi. My present camp, named *Lulanguru*, is where I was for a brief period at the end of July and beginning of August, viz. 17 miles west of Tabora. It is a flat, deciduous bush country with granite kopjes. I told you something about the place before: since my last visit the new green growth has begun to come in readiness for the rains, and it is very pretty and springlike. I was glad to leave Itigi, where I was not at all justifying my existence and doing nothing to help on the war, and I got very tired of the place and of the

more of the railway and engines. My job here is to look after a very large number of Congolese porters—15,000—who will be sent through in batches. As they all come from Sleeping Sickness country, and are going to a 'Fly' country (the rivers of G.E.A.), it is important that all cases of Trypanosomiasis should be kept back. So I have to examine each man to exclude S.S., and then vaccinate, etc. I am quite glad to have a job of work again, and particularly to feel that I am again in touch with 'my friend the enemy,' S.S. I hope at less busy times that I shall be able to send you some more butterflies from here, especially *Crepidomima*, as before. So there's no chance of leave yet, but I don't mind now that I have got a useful job to do.

"Nov. 2, 1917. *Lulungu.*

"I'm very happy here now that I've got, at last, a job of work to do again. Since the middle of October, when I got here, three batches of Congolese of about 450 each have arrived, and I have examined all of them and rejected some for apparent early Sleeping Sickness. It's very interesting seeing natives of such different type from what I have seen hitherto—they are many of them very very small: these, of course, are from the forests. It is said that altogether 15,000 are coming through here, but though that sounds a large number it's only enough to make good the wastage of *all* porters for *one month*! I have about 60 in hospital; every batch that arrives leaves me with cases of Pneumonia and Amoebic Dysentery, but thank goodness they seem free of Cerebrospinal Meningitis, which has been a great scourge in some parts.

"Our local war is so far away (some hundreds of miles! I am 17 miles W. of Tabora) that we only know what the weekly official wire tells us, but the one we got this morning announced such a haul of prisoners and killed that one's hopes rise again that after all it *may* be finished this year. If they can't get it done before the rains begin in January they will have to wait until June at the earliest before they can begin again!"

Speaking of Itigi: "Fortunately I found some thorn

Acacias in flower, and bottled lots of minute Hymenoptera for the Bureau. Many are very curious-looking Chalcids, and one a veritable giant about an inch long: I had never met with one more than half that size before. I wonder if it will turn out new. [Dr. Marshall has not been able to determine the insect, but thinks that it is a *Larradomorpha*, of which Capt. Carpenter had previously sent another fine species.]

"Here at Lulanguru I bag great numbers of things at light. Has this curious fact ever been recorded, that on different nights different species predominate? About a week ago one kind of Melolonthid, later another, last night a third, with two small Chrysomelids, and to-night, as I write, numbers of small actively flying *Carabidae* of several species, none of which have come on any previous night. I suppose the explanation is that large numbers of one species come out at approximately the same time from the pupa.

"Nov. 14, 1917. *Lulanguru*.

"The Itigi butterflies are mostly a long series of pairs of *Pierines* in cop.: *P. simana*, *Belenois*, and *Teracolus*, a propos of what I wrote before (Proc. Ent. Soc., 1917, p. lii) that Darwin had said *Pierine* ♀ carry ♂. In all these cases ♂ carried ♀, save in one *P. simana*, which was probably a mistaken observation. The only other things of interest from Itigi were a number of very fine *Eastern zetes*, and sundry minute Hymenoptera and beetles for the Bureau.

"*Charaxes* abound on the kopje and some look interesting.

"Hot and exhausting weather.

"Nov. 27, 1917. *Lulanguru*."

Extracts from this and other letters on *Pseudacraea poppi* Dew., and its form *carpenteri* are published in Proc. Ent. Soc., 1918, pp. v-viii.

Writing of *Charaxes*: "I fancy I can spot mimics in one case at least. This kopje here is the best locality I have struck for them, except perhaps Kakindu, but then that was a large forest, whereas this kopje top is only a few hundred yards square.

" Pretty busy in *mornings* now: we have about 2000 in camp, and they arrived infected with measles, mumps and chicken-pox. I feel as if I was in charge of a boys' school! But I can collect most afternoons. We are having heavy rains now— heavier than I remember at this time last year.

" Nov. 30, 1917. *Lalangura*.

" The only larva of *P. sinant* escaped when it was too late to get more, as I was expecting to be moved! A pity!

" I am continuing to get *Crepidomimas* here, and have now got 4 or 5 more specimens, all, so far as I can see, the same as before. I haven't seen a single model! I don't know why the model *shouldn't* be here. [Capt. Carpenter, who is always interested in the success of a mimetic likeness, will be delighted to know that only four days before he wrote this letter, he caught the model *Crenis pichueli*, Dew., and labelled it as the mimic; also that he labelled two unusually bright and fresh *Crepidomimas* taken in Port. E. Africa (p. cxxiii) as "*Crenis*."] *P. leonidas*, F. (blue S. form), *saracus*! By the way, yesterday I saw a magnificent *Ps. bisulcatus trimentii*, Butl., typically Eastern, high overhead and so out of reach that all I could do was to break my neck goggling up at it!! So that makes the third species of *Pseudacraea* here. *Poggei* continues to be caught! also *Chaerxes*!

" Dec. 7, 1917. *Lalangura*.

" I have got some *Nymphalines* here *in cap.*, in all of which the ♂ carries ♂♂—a *Precis* [*actia*, Dist., dry f.], *H. daedalus*, F. (twice), and *Ps. poggei*, Dew. It seems to me that *in Puerinae* the ♂ carries ♀ and *in Nymphalinae* the reverse. In a single pair of *Lycaenidae* (*Tarucus telicanus*, Lang) the only one I have noted—the ♀ carried the ♂."

Between Dec. 19 and Jan. 2 Captain Carpenter captured 1 more pairs of *telicanus*, and in all but one, with the smallest female (carried by the male) the male was being carried by the female, and the same was true of a single pair of *Axiocerses amanga*, Westw. (Dec. 31), and of *Ilarusa alerposita*, Butl. (Jan. 1), as also of the Satyrine *Ypthima asterope*, Klug (Dec. 11), and the Acraeina *A. eueclon*, L., type form (Dec. 12). As this paper is being prepared for

the press the following note has arrived, written May 5 1918, at Isipingo, on the coast near Durban, where Capt. Cameron is spending his leave: "A propos of pairs *in cop.* I saw on the 2nd something of considerable interest. A fine pair of *P. dardanus*, Brown, flew by *in cop.*, alighted close by, flew off again, alighted and flew off once more, so that there was no possible doubt whatever that the ♀ *cenea*, Stoll, was supporting the ♂, which remained passive with wings closed. Of course I had no net, and so could not secure the specimens; but I think the observation of value as it is so difficult to make out which sex carries which in *Papilioninae*, and one doesn't often see *Papilios in cop.*"

[The specimens from Isipingo (1918) have now arrived and include the following pairs of *Pierinae*, in all of which the male carried the female: *Eronia cleodara*, Hübn., May 13; *Teracolus omphale*, Godt., May 11; *Belenois gidica*, Godt., May 23; also a pair from Saranda, 7 m. N. of Kilimatindi, ex-G.E.A., Feb. 5; *B. severina*, Cr., May 13 and June 6. In addition to the *Pierinae* the Nymphaline *Byblia gordius*, Herbst., May 13, the male carrying female. From Ankwale, Port. E. Africa, 40° E., 13° S. (1918), the following very interesting *Acraeinae* pairs: 3 *A. caldarena*, Hew., the larger female carrying the smaller male, Aug. 1, the larger male carrying the smaller female, July 29 and 31; 2 *A. natalica*, Boisd., female carrying male in both, female distinctly larger in one pair, Aug. 29, a little smaller in the other, July 31. Also the *Pierine* *Terias brigitta*, Cr. (dry-season form), smaller male carrying larger female, July 4, and similarly in a wet-season pair from 31° 55' E., 4° 40' S., ex-G.E.A., Feb. 12. From Monapo, Port. E. Africa, 30 m. due W. of the coast opposite Mozambique Islands (1918): *Acraea oncaea*, Hopfl., the male carrying the distinctly smaller female, Sept. 15; *Neptis agatha*, Cr., the female carrying the much smaller male, Sept. 11.]

[These results may be compared with those recorded by the Rev. George Wheeler in "The Entomologist's Record" for 1918, p. 152. In the single pair of *Dryas paphia* observed by Mr. Wheeler the male was carrying the female; but Mr. H. Donisthorpe ("Record," 1918, p. 171), Mr. Colbrun

(*ibid.* 1917, p. 246) and Mr. Wheeler himself (*ibid.* 1917, p. 166) have found both male and female taking the active part. Mr. Hamm also saw, near Winchester (July 1896), a male paired with the *colesina* female, and the latter, which could not be mistaken, supported the former. More evidence is required for all groups except the *Pieridae*. For these Dr. Dixey's conclusion on p. clii, will meet with general acceptance. In this group, indeed, the males appear to take the active part even when smaller than the females.]

Returning to the letter of Dec. 7: "We have just heard unofficially that von Lettow, the enemy commander, with what forces are left him, has got across the Rovuma R. into Portuguese East Africa. I'm not sure that it's good news, although it now means that the country is free of Germans, all the other bands having been accounted for. But the affair won't be over till the gallant von Lettow is also accounted for. He certainly is to be admired for his spirit.

"Dec. 9. Sunday. Thundering and raining now and very cool!"

The following account of Lulunguru, written for the Entomological Society, was sent with the above letter of Dec. 7:

"This camp, 17 miles west of Tabora, is on the Central Railway and also on the main road from Dar es Salaam to Ujiji, along which countless slaves must have gone down to the coast in old days, and up which Stanley may have come to Ujiji. It lies in country which I am told by a Rhodesian is much like parts of N. Rhodesia. It is flat, 1148 metres above the sea, with scattered irregular low hills and kopjes of granite. The bush is of the open kind with small, not thorny, deciduous trees, now in full spring leaf, and the grass is sprouting again, so that everywhere it is delightfully green. We had about a week of quite heavy rain a little while ago.

"My collecting ground here is on a kopje immediately behind the camp, which seems to concentrate insects from the surrounding flat country: at any rate, until I started collecting on its summit I never found anything worth much.

"I will first go through the successive groups of butterflies and then give a few notes on other Orders.

"*Papilioninae*. I very soon found there was a handsome species [*P. anthus nyassar*, Butl.] here, new to me, reminding me of *policeus*, Cr., but appearing paler, and with longer tails. Curiously enough I do not find its tails nearly so brittle as in *policeus*, of which it is hardly possible to take a perfect specimen out of the net.

"I suspect this species to be a Southern form, as I have never seen it before: it is a beautiful, Oriental-looking thing.

"*P. leonidas*, F., is very common. It is of a blue form, and thus new to me, as I have hitherto only met the greenish form of Uganda. It has favourite spots over which it will soar backwards and forwards [see S. A. Neave in P.Z.S., 1910, p. 68], and if one is caught, another will almost at once haunt the same spot. I have not seen its model here."

Capt. Carpenter's specimens entirely confirm his statement, being distinctly bluer than those from further north. I remember that this point was raised inferentially in a letter written to me from Katanga or North-East Rhodesia by Mr. S. A. Neave. In it he maintained that *leonidas* was a mimic of an *Amauris* of the type of *hyalites danielfelti*, Auriv., rather than of *Tirumala petiverana*, Dbl. and Hew. He referred in his letter to the apparent blueness of the former in the wild state as being very different from its black-and-white appearance in the cabinet. In his paper published later in the Proc. Zool. Soc., 1910, p. 8, Mr. Neave says that the transparent spots of the model's fore-wing, "due perhaps to their more or less green background in nature, look pale green on the wing." But in writing to me I distinctly remember how he emphasised the blueness.

Mr. Neave kindly wrote on March 29, 1918: "Yes, I recollect that examples of *P. leonidas* from Uganda were greener than those from North-Eastern Rhodesia and Katanga. I have no definite recollection about this species in German territory. I was there such a comparatively short time that I may not have taken it at all. I think I originally wrote you re the apparent blue or green colour of the white patches of *Amauris* from Katanga, as this was the first locality in which I had seen examples of the *Amauris* of this group in

life. The apparent colour varies from blue to green with the background."

Mr. Neave wrote again a few days later: "I have had a look at the B.M. series, and it seems probable that examples from the drier parts of Africa are mainly of the blue type as compared with the greener ones from more humid localities. I am not sure that the point is of great importance, though the apparent colour in the *Amauris* models varies with background, being greener in shade and amongst vegetation and bluer in bright sunshine; they would therefore appear more often of the latter colour in drier and more open situations in which, however, they are comparatively rare."

Capt. Carpenter continues: "*Papilio* (*Osmodesmus*) *pyglades angolanus*, Goeze, abounds: it is a curious-looking thing on the wing, and sometimes as it dashes past has rather a Pierine appearance. *P. demodocus*, Esp., is common. I have seen a ♂ *P. dardanus*, Brown; somehow it looked slightly different from the forms I knew on the islands in L. Victoria, and I am wondering whether it also is from the south [probably the Eastern form with a much heavier submarginal black band to hind-wing]. It will be interesting if I can get a female, for since I came here in October I have not seen a single species of its models, and I have collected almost every day. Presumably *cenea* [probably *hippocoon*, F.] would be the commonest form. These five are the only Papilionines I have met as yet.

"*Pierinae*. I know so little of the names of these that I cannot say much about them. *Belenois* and *Catopsidia* (the thing like a Brimstone) are not very common. I haven't seen either *Eronia leda*, Boisd., or *cleodora*, Hübn., here. A *Terias* of a form strange to me [*T. regularis*, Butl.; see pp. cl, cli] is plentiful and a few fine large *Teracodus* [*T. casta*, Gerst.] not uncommon, but the feature of the Pierine fauna is a magnificent large, fragile, pure white species with steely purple tips to fore-wing [*Teracodius regina*, Trim.]. It is of extremely powerful flight and is very shy, and therefore almost impossible to catch except when lulled by clouds or in the evening.

"Of *Nymphalidae* there are some good species. It is a

marvellous thing that since I came here I haven't seen a single *Danaine* of any kind whatever! [A ♀ *D. chrysippus* L. of the type form was taken a little later, on Dec. 31.]

"*Acraeinae*.—These have not proved to be plentiful: there are one or two species that I never met until I had come a good way south of the lake, and imagine they must be South African forms. *A. zetes*, L., occurs in its typical Eastern form [*acara*, Hew.] with yellow suffusion and very little black. [The Lulanguru species was not *acara*, but *anemosa* (11) with a single *astrigera*.] It is thus more lovely than the forms I met on the islands. I find it *extremely* shy and difficult to approach—far more so than such an aposematic and tough insect need be! I am quite sure that the Eastern forms I have met are far more difficult to catch than the island specimens were. *A. encedon*, L., occurs—rather washy and uncertain in colour. It annoys me because I have never found its larvae, and yet one sees it in all kinds of country, so it must feed on some universally distributed food-plant. [The larvae feed on the water-plant *Commelina*, "Sudd." The Lulanguru collection contains—taken between Nov. 22 and Dec. 24—2 ♂♂ and a ♂ and ♀ *in cop.* of the type form, and 6 ♂♂ of the form *daira*, Godm. and Salv. Thus the *daira* form was not nearly so predominant as in Capt. Lamborn's collection made further east and north; Trans. Ent. Soc., 1917, pp. 327, 328.]

"*Nymphalinae*.—*Charaxes* abound on the kopje and several forms are new to me. It is a wonderfully exciting spectacle for an entomologist when these magnificent creatures chase each other in the bright sun through the trees with their new greenery. I saw one day a never-to-be-forgotten sight—two species whose names I know not chasing each other, both in perfect condition, one with the basal half of its wings sky blue, the rest black [the ♂ *bohemanni*, Feld.], the other with a broad border of rich terra-cotta to its velvety black wings [the ♂ *azota*, Hew.]. I put down rotten bananas as bait (remembering Swynnerton's tip) and have taken about a dozen different forms, though how many *species* I know not. The above-mentioned blue one, in ♀, has a very conspicuous white bar on the underside of the f.w., which I am certain

as an aposeme when it is feeding [a note to this effect accompanies a ♀ *bohemanii* of Dec. 1]. It is resembled by a much smaller species [the *manica*,* Trim., ♀ of *etheodes*, Cr.]. A specimen of the commonest small species [*guleriana*, Dew.] was once caught by a large Asilid fly, just as it was fluttering round the bait: this speaks well for the power of the Asilid, I am sending prey and captor."

Helinus alamanus, Walk., ♀ with the ♂ of *Char. guleriana*, Dew., Nov. 12, 1917. The Asilid bears the note "probably caught as it was fluttering round bait or on it, but I did not actually see it in act." Capt. Carpenter also sent a male of the same predaceous fly together with the ♂ of *Char. achæmenes*, Feld., captured by it Dec. 13, 1917. Both butterflies are included in the table on p. cxxi.

Capt. Carpenter not only recognised the mimetic resemblance of the *manica* ♀ to the ♀ *bohemanii*—the note "? mimic" appears on 4 examples of the former and "? model" on an example of the latter taken with one of them on Nov. 20—but he also noted the resemblance of the females of *achæmenes* and *guleriana* to both sexes of *saturnus*, Butl. Examples of each female and a male of *saturnus*, taken Nov. 17, bear the note "? mimetic relation: same spot and time." These and other records of the three species on the top of the kopje at Lulanguru afford valuable independent testimony to the validity of Dr. Marshall's suggestion (*ibid.*, p. 505). These captures at Lulanguru in one limited area, of mimetic *Charaxes* and their models among the larger species of the same group, are recorded in the tabular statement on p. cxxi. I have included the ♀ *azola* as a probable mimic of both sexes of *euranes volceses*, R. & J.

It is probable from Capt. Carpenter's experience that the *manica* ♀ of *etheodes* occurs where *bohemanii* is abundant and its female—more conspicuous than the male—commonly seen. Where this large species is scarcer the ♂ probably becomes a more advantageous model than the more rarely seen ♀, and *manica* is replaced by the *phaeus*, Hew., of the same species.† To test this conclusion we need from

* See footnote on p. lxxx.

† This paragraph requires revision in the light of Mr. Dollman's recently published evidence. See footnote on p. lxxx.

other localities where *bohemannii* is a model such facts as are now recorded for Lulanguru, or such as Mr. S. A. Neave, the Rev. K. St. Aubyn Rogers, Mr. C. F. M. Swynnerton and Major C. A. Wiggins have made available for other forms of the ♀ *etheodes* and their models. The *phaeus* f is recorded from Tabora, near Lulanguru (Rothschild and Jordan, Nov. Zool., vii. 1900, p. 488), and Mr. St. Aubyn Rogers took it at Mamboya (Proc. Ent. Soc., 1918, p. lx), while Capt. Carpenter captured an example on June 11, 1916, far to the N.W. in the Ruanda Country, near Kigala. The locality is described as open country in 30° 15' E., 2° 10' S. The suggestion that the specimen is a mimetic ♀ of *etheodes*, new to the captor, was written on the "paper." Capt. Carpenter was not sufficiently long in the locality to be able to determine the existence or relative numbers of *bohemannii*. Further north in the strip of tropical forest near Kikindu (Proc. Ent. Soc., 1916, p. cx) he took two examples of the beautiful new ♂ form of *etheodes* described on p. lxxxii; also, in the same forest, its model, the ♂ of a larger *Charaxes*, viz. *etesipe*, Gult. At this point it is of interest to record his capture on June 28, 1916, in 31° 15' E., 2° 40' S., of a ♂ *Ch. hawali baringana*. Rothsch., thus greatly extending the known range of this rather rare form, described from Lake Baringo, B.E.A., and taken by the Rev. K. St. Aubyn Rogers in the Hills of Taita W.N.W. of Mombasa.

"*Crenidomimus* is not uncommon on the kopje, and now that I have learnt its habits I have got a number, which you will find interesting. It has a very skimming flight, which is much like that of *H. daedalus*. The latter, of course, keeps very near the ground, while *Crenidomimus* prefers to fly 10 feet or more high, but it does not make long flights, and returns over and over again to its favourite perch on the extreme tip of a spray 6-12 feet above ground, so that it can usually be caught. It often settles head downwards on tree-trunks, but is very very wary and extremely difficult to catch in such a position."

It is likely that the butterflies seen on the tree-trunks were *Crews* and not *Crenidomimus*. Mr. S. A. Neave, with a very extensive experience (Proc. Zool. Soc., 1910, pp. 32.

MODELS AND MIMICS AMONG THE CHARAXES ON THE KOPPE AT LALANGURU

1875-1876

	Bohemian, Feld.	Ethiopia, Cr.	Saturnus, Bull.	Achaemenes, Feld.	Giadrima, Dew.	Yabans volu- gus, R. & J.	Azda, Rew.
	Males.	Females, Monst. A. Females, monst. B. Females of A.	Males. ♂ and ♀ albos, Monst. B. Females: minims of B.	Males. Females: minims of B.	Males. Females: minims of B.	F. and ♀ albos, Fugitive-Monst. A.	Females: prole- tic minims of C. Males.
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14	2	1		1	1		
15		1	1 ♂	2	1		1
16			1 ♀				
17			1	1	1	1	1 ♂
18	2	2	1	3		2	2
19			1 ♀				
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33, 38), writes: "I cannot recall ever having seen *Crenidomimas* settle on a tree-trunk, though the blue species of *Crenis*, of course, do so often—generally rather high up. Most of my examples of *Crenidomimas* that I caught settled were on damp sand. As Carpenter says, they may often be seen on the tips of boughs." [The suggestion contained in this paragraph has now been submitted to Capt. Carpenter, who has replied that the first *Crenidomimas* taken by him (at Namirembe Bay, July 27, 1916) was certainly settled, head downwards, on a tree-trunk, and that at Lulungu these butterflies were captured at the flowers of a Papilionaceous tree as well as on branches and tree-trunks.]

The Lulungu collection contains 17 *concordia*—1 ♂ and 3 ♀♀ taken July 26-27, 12 ♂♂ and 1 ♀ between Nov. 19 and Dec. 17. Six of the specimens are injured, probably in most cases at least by enemies. It has already been stated (p. cxiii) that a single example of the model *Crenis peckuei* was taken on Nov. 26. A ♀ *concordia* was captured on the following day, a ♂ on Nov. 28, and another on Nov. 29. The occurrence of *Crenis peckuei* at Lulungu extends its range considerably to the N. and E., the localities given by Aurivillius in Seitz being Congo [probably only the S.E. of the State], Angola, Ovamboland, and Upper Zambesi.

Mr. Neave writes: "*C. concordia* is a more widely spread insect, both in *time* and *space*, than the blue *Crenis*. The latter are not only decidedly local, but are only on the wing for a relatively short time. On the other hand, when they do occur they are much more numerous than I have ever seen *C. concordia*. I know of many places in Nyasaland where the latter is not uncommon but where the *Crenis* are absent. On the other hand, Carpenter can hardly be sure that the *Crenis* are not present in his locality until he has spent a whole cycle of the seasons there."

In addition to the *concordia* from Lulungu, Capt. Carpenter took a ♂ on July 27, 1916, at Namirembe Bay at the S.W. corner of the Victoria Nyanza, and a ♂ and ♀ Aug. 8-14, 1916, at about 32° 20' E., 3° 20' S. The two latter resemble the Lulungu series, but the first and most northern differs in exhibiting an orange-ochreous wedge in area 6 of the fore-

wing upperside—a feature which appears in a few of Mr. Neave's captures from much further south. This marking, which is probably ancestral, deserves special study in long series from as many localities as possible. No models were taken with these three examples. The hind-wings of the Namirembe ♂ are symmetrically shorn, probably by a bird. [Since the above was written a ♀ *concordia* taken on July 31, 1918, in a dry stream bed at Ankwabe, Port. E. Africa (40° E., 13° S., about 1000 ft.), has been received (labelled "Crenid") from Capt. Carpenter. The specimen, which is beautifully fresh, exhibits an unusual development of yellow over the basal half of the upper surface of both wings, especially marked in areas 7 and 8 of the hind—a result which may be related to the outlying locality on the E. fringe of the range. Still later another fresh ♀, also labelled "Crenis," has been received from Monapo, Port. E. Africa, 30 m. W. of the coast opposite Mozambique Islands (Sept. 13, 1918). The basal areas are only slightly yellowish.]

Concerning these 3 *C. concordia* 1916 spoken of in the 1st paragraph Capt. Carpenter wrote on May 20, 1917, from Itigi: "I had rather suspected that the *Crenidomimus* was a mimic. I seemed to remember a picture of it in Eltringham's book ['African Mimetic Butterflies,' pl. vi, fig. 15]. I only caught three or four, I think, and it was excessively wary and not at all abundant. I did not ever see a model, but as the country was in the dry period it doesn't do to conclude that the model is not there. It was in very open country, sometimes thorn bush, which is extremely bad for butterflies generally. Didn't I get some *Crenis* in the Kakindu forest? But probably not the species which the *Crenidomimus* mimics." [None of the blue species are in the Kakindu collection.]

Capt. Carpenter's account of the Lulunguru *Nymphalinee* continues:

"The cream of the Nymphaline population at Lulunguru is provided by my pet genus *Pseudacraea*. [The notes on *Ps. poggei*, Dew., and the new form *carpenteri* are published in Proc. Ent. Soc., 1918, pp. v-xxii.]

"To take the least interesting species first, *lucretia* [*expansa*,

Butl.] is quite common. I fancy it is not quite of the same form as the one I am used to on the islands [*lucetia* *lucretia*, Cr.].

"*Ps. boisduvali trimenii*. Butl.—I have to-day caught my first specimen of this splendid Eastern form. It is certainly much more like its model *zetes acara* [*anemosa* in the Lulanguru collection, see p. cxviii] (also of Eastern form here) than the specimens I caught on the islands. Perhaps the yellow suffusion in each case helps. [The ochreous subapical patch on the fore-wing is well developed in this ♂ example of the Eastern *trimenii*.] This specimen was flying high, and floating about in an exasperating way until it at last came within reach of a vigorous swoop. Seeing that both *trimenii* and *poggei* exist here I shall keep a sharp look-out for *imitator*! It would be splendid to get that too.

"The only other Nymphaline I have to mention from here is a *Precis* of a form new to me which I think may be a dry-season form [either *archesia*, Cr., or *antelope*, Feisth.] of one that I have hitherto only met 'wet,' but it is difficult to carry the differences in one's head without having specimens for comparison. There was an interesting form [*P. antelope*, Feisth., wet form *simia*, Wallgr.] which I first met with last January: it continued abundant all through the rains, after which it vanished, and has not yet put in an appearance again: * it interested me chiefly because its underside *very closely* resembled that of the wet or *natalensis*, Staud., form of *P. octavia*, Cr., though the upperside was very distinct."

Capt. Carpenter's collection made during his journey with the Belgian Northern Forces and his sojourn at various camps contains a most interesting series of 5 species of *Precis* in which the seasonal differences are marked, and, in all except *artasia* Hew., extraordinary. As so little is known of the butterfly fauna of the area he traversed I have thought it desirable to add on pp. cxxviii-cxxxi a tabular statement of these five

* "Since I wrote the above this *Precis* has appeared, simultaneously with the wet form of *octavia*, Cr.; the coincidence is very striking. [Note added to duplicate copy of the account of Lulanguru, posted Dec. 24, 1917. It will be seen in the tabular statement that the wet form of *octavia* first appeared on Dec. 15, of *antelope* on Dec. 17.]

species as they were taken in the year and a half from June 6, 1916, up to Jan. 2, 1918. It is unnecessary to say anything of the geographical forms of the species, which are of the *precis* characteristic of the S. and E. of Africa, except the two following.

Precis archesia, Cr.—The wet forms (*pelasgis*, Godt.) are on the whole intermediate between the most extreme wet forms from further south in which the dark ground-colour of the under surface is continuous and unmarked, and those from the tropical north in which it is freely sprinkled with grey scales (Trans. Ent. Soc., 1908, p. 546). Capt. Carpenter's examples exhibit a variable amount of grey sprinkling, especially over the basal area of both wings. The outer red transverse streak in the F.W. cell is distinctly represented in grey on the under surface of nearly all the specimens, and is usually accompanied by a much slighter indication of the shorter basal red streak. Forms of *pelasgis* like these are common both to the N., where they are accompanied by "drier" patterns, and to the S., where they are accompanied by "wetter," all being modifications of *pelasgis* with the characteristic "wet" outline of the wings.

The dry or *archesia* forms, as represented in Capt. Carpenter's collection, are remarkable in that they are never of the full dry phase. The 10 examples taken June 13-20, 1916, as well as the 2 of July 26, 1917, are all nearer to *standingeri*, Auriv., than to any other form. The upper surface is of the full dry phase, the under falling short in the nearly uniformly coloured basal and, usually darker, distal areas, diversified only by a wash of grey especially marked in the distal area, and more strongly developed in the individuals with a fuscous ground-colour, less in those that are brown. Thus the appearance is very different from that of the intensely variegated, highly procrystic, variable patterns which are the commonest forms of the dry phase in S. Rhodesia and Natal: see Trans. Ent. Soc., 1902, pl. xiii, fig. 6. as compared with fig. 7, which, although exceptional in Natal, where it was captured, fairly represents the 12 forms of *standingeri* taken by Capt. Carpenter. The basal area of a single individual (June 15, 1916) bears indistinct reddish marks

approaching those of the examples taken Nov. 11-27, 1917. These 9 worn specimens are nearest to *semitypica*, Auriv., and one of Nov. 11 may actually belong to this form. The others differ in opposite directions on the two surfaces, the upper being wetter in the absence or very faint development of the blue transverse streaks in the F.W. cell, the lower, of a uniform dark brown in both areas, drier in the traces of variegation caused by obscure reddish streaks in the basal area, which in the F.W. follow the upper surface pattern; these streaks are only present on the H.W. of some of the individuals, and here there is no correspondence with the upper surface pattern. In one example of Nov. 11 the reddish markings are accompanied by black streaks. It is unfortunate that all these interesting forms are in such bad condition.

Although, as Aurivillius states, both *staudingeri* and still more *semitypica* are transitional in pattern towards the wet phase, they are both very far on the dry side of intermediate, the form of the wings—a difference far more important than colour or pattern—remaining as in the full dry phase.

A single example of *limnoria*, Klug, wet f. *taveta*, Rog., from Itigi, Oct. 12, is omitted from the table. Aurivillius keeps *limnoria* as a distinct species, but transitional forms occur between it and *archesia* f. *pelasgis*, and the Rev. K. St. Aubyn Rogers, who has taken *limnoria* in ex-German East Africa and is familiar with it in B.E.A., believes that the two are conspecific. Further breeding experiments and structural investigations are greatly needed, as also with *pelasgis* in relation to *coelestina*, Dew. There is in the Hope Department a series of specimens, collected at the N.E. corner of the Victoria Nyanza by Major C. A. Wiggins, which includes both wet and dry forms of *coelestina* and also butterflies with the upper surface pattern of *pelasgis*, or its var. *chapungu*. Hew., combined with an under surface apparently transitional towards the wet forms of *coelestina*. Omitting the consideration of *limnoria*, by far the commonest and in most localities the only form of *archesia* in British East Africa and Uganda is the wet-phase *pelasgis*, a little short of the full wet form from South Africa. See Nov. Zool., xi, 1904, pp. 348, 349.

where Mr. Neave records 42 *pelagis* from N.E. corner of Victoria Nyanza, Entebbe and Toro: also Trans. Ent. Soc., 1908, p. 546. Examples bred by the Rev. K. St. Aubyn Rogers at Weithaga, B.E.A., were only slightly less "wet" than the parent (*ibid.*, pp. 545, 546).

Precis artaxia, Hew.—The few examples of this species afford an interesting contrast with *archesia*: for although both appeared as wet and dry forms in the areas traversed by Capt. Carpenter, *archesia* is represented by *wet* forms in the tropical belt to the north, whereas all the specimens of *artaxia* collected by Major Wiggins in the above-mentioned locality were small *dry* forms, of which 42 are recorded by Mr. Neave from Ugaia on the N.E. shore of Victoria Nyanza (*ibid.*, pp. 348, 349). Dr. Marshall and the late Capt. F. C. Selous also observed the predominance of the dry form in certain parts of S.E. Rhodesia and Portuguese E. Africa, and it is probably adaptively connected with forested areas (Trans. Ent. Soc., 1902, pp. 423, 439–441). Although the number of specimens is so small, both *nachtigalli*, Dew., and the more extreme wet form *nobilitata*, Thur., were taken by Capt. Carpenter.

It is of interest to compare the remaining species of *Precis* in the following table with Mr. Neave's records from the equatorial north (i.e.). Capt. Carpenter's *actia*, Dist., exhibits both dry forms, *actia*, and wet, *furcata*, Rothsch. and Jord., while the 10 northern records are all of *furcata*. Mr. Neave's figures for *octavia*, Cr., also represented by dry and wet forms in the following table, are unfortunately erroneous, probably because the author had suddenly to leave England before the proofs of his paper were corrected. Specimens recorded as the dry form, *sesamus*, Trim., were examined and found to be the wet form *natalensis*, Staud., by Miss Britten, who has made a careful study of *octavia* in the Hope Department. Furthermore, the large numbers of *octavia*, *actia*, and *archesia* sent to me in more recent years from the neighbourhood of Entebbe by Major Wiggins are all wet forms. Only in the Toro Forest on the W. shore of the lake, near the old Anglo-German boundary, do the dry forms of *octavia* begin to appear, and this locality, although so near to Entebbe has

Ex-German East African Species of *Ircia* with pronounced dry and wet forms, w = worn.

LOCALITIES.	DATES.	Dry and Wet Seasons.									
		<i>capitata</i> , Cr.	<i>Angitia</i> , F. subsp.	<i>Angitia</i> , F. subsp.	<i>Ircia</i> , D. subsp.	<i>Ircia</i> , D. subsp.	<i>Ircia</i> , D. subsp.	<i>Ircia</i> , D. subsp.	<i>Ircia</i> , D. subsp.	<i>Ircia</i> , D. subsp.	<i>Ircia</i> , D. subsp.
Ruanda Country, 30° 45' E., 2° 10' S., 1916, June 6											
	" " 13	1			1						
	" " 14										
Hills W. of Kagera River, 30° 55' E., 2° 15' S.	" " 15	1									
	" " 16										
	" " 17										
W. bank Kagera River, 30° 55' E., 2° 15' S.	" " 19										
W. bank of Kagera River, 30° 55' E., 2° 25' S.	" " 20										
Between last locality and Namtambo Bay.	" " 25										
Namtambo Bay, S.W. Victoria N.	" July 27										
S. Mt. Kilimanjaro, 32° 15' E., 3° 45' S.	" Aug. 23										
Dry season, but light rains early October	" Sept. 14										

Ex-German East African Species of *Pteris* with pronounced dry and wet forms. w = wett, w = weim.

Geigeria, Cr.	Wet form <i>acrostichos</i> .	Wet form <i>indulgentis</i> .	Dry form <i>antelope</i> .	Wet form <i>alwin</i> .	Dry form <i>acrostichos</i> .	Wet form <i>furcata</i> .	Nearly fully dry, near <i>stunningi</i> .	(In Dry side of Intermediate f. near <i>swillingi</i>).	Wet form <i>pelagica</i> .	Dry form <i>acrostichos</i> .	Wet form <i>extreme nobilis</i> .
	1			1							
				3							
				1							
				5							
	1		1		1						
	1						2				
								2 w			
								1 w			
								1 w	1		
								1 w			
								1 w			
								1 w			
								1 w			
								1 w			

Dry and Wet Seasons.

D R Y S E A S O N

1917, June 1

" " 4

" " 9

" " 12

" July 25

" " 26

" Nov. 11

" " 17

" " 19

" " 22

" " 23

" " 24

" " 26

High—Continued.
Wet season till about May 25,
then dry.

Lulungu. Dry season till end
of November, then wet.

1917, Dec. 1	WET SEASON												1
	5	12	23	35	6	7	12	9	15	4	3		
" " 7									1			1	
" " 11									1			1	
" " 13									2			2	
" " 15		1							3			3	
" " 16			4						1			1	
" " 17		2	4	1					1			1	
" " 20						2			1			1	
" " 21		2		1									
" " 23				1	1	1							
" " 24		1		1	1	1							
" " 25						1						1 mod.	
" " 27							2						
" " 31									1			1	
1918, Jan. 2													
TOTALS	5	12	23	35	6	7	12	9	15	4	3		

Lullangum, Wet season from
end of November.

a very different climate with a regular wet and dry season, as Miss Britten ascertained from the meteorological records, and as Mr. Neave observed on the spot. Although *octavia* appears to be always wet in equatorial Uganda and perhaps in the extreme W. of B.E.A., this is by no means true of B.E.A. as a whole, for many records testify to the existence of dry forms (Trans. Ent. Soc., 1902, p. 447; 1908, pp. 542-44).

Precis antilope did not appear in the collection studied by Mr. Neave, but both dry and wet forms occur in equatorial B.E.A. (St. Aubyn Rogers, Trans. Ent. Soc., 1908, pp. 541-45).

Looking at the above tables it is seen that *Precis octavia* and *P. actia* follow the dry and wet seasons with precision except for the presence of 2 wet forms of *octavia* in the first dry period, and these, being worn, had probably lived for a considerable time. The record of *artaxia* is very similar. *P. antilope*, on the other hand, shows a strong tendency to anticipate the seasons, both wet and dry, as is seen in the group of wet forms taken Jan. 8-Mar. 21, 1917, and the dry between Apr. 1 and July 25 of the same year, the latter being mixed with wet forms towards the end of the wet season. *P. archesia* follows the seasons except for a single early wet form on Nov. 19, 1917.

"*Satyrinae*.—There is a species here on the kopje and elsewhere that is new* to me—a pretty fawn-coloured large species [*Herotesia simonsi*, Butl.]. There are others (*Ypthima*, etc.) here which are probably different from those I have sent before.

"*Lycenidae*.—There are very few on the kopje, but when here for a week in August I got a fine species new to me, which you have received previously to this letter—one of those with the spots on the underside split. The male is of a coppery brown colour [*Deudorix dinockares*, H. Gr.-Sm.]. However, there are, I think, two other species here new to me which I send now. One of them has a very boldly marked underside [*Spindasis homeyeri*, Dew.]: it has its tails abstracted by some enemy. The other is one of those rich copper-coloured forms with red brown underside and very short twisted tails. [Both *Axioceres karpae*, F., and *ananga*,

Westw., were taken : a ♂ *harpar* bears the note " Oct. 26. 1917. Settled on me to drink sweat." I have not seen any of those lovely light blue species with long milky white tails : I think they require forest and not open bush."

Probably the most interesting Lycaenid from Lalanguru is *Alaena interposita*, Butl., of which a long series of both sexes was sent. It is certainly the species described and figured as *A. haulteoeuri* by Oberthür in " Etudes," 12. p. 7. pl. 3. figs. 7 and 9 (1888). The figures are, as usual in this great work, admirable, and the examples described were from Tabora, only 17 miles from Lalanguru. It is unfortunate that Butler's *interposita*, described in 1883 from a single nearly female-coloured male from Victoria Nyanza, should take precedence over Oberthür's name accompanying the description and figures of the typical form. Aurivillius in " Rhop. Ethiop.," p. 255, is mistaken in sinking Butler's *Alaena aurantiaca*—a very different species—to the male of *haulteoeuri*.

Two of Captain Carpenter's examples of the yellow male bear interesting notes : " Oct. 24, 1917. Acraeine mimic. When unalarmed flight looks like small *Acraea*," " Oct. 27. On stony kopje where long dry grass. Flight slow and fluttering like *Acraeina* on wing. One specimen was bottled as it sat on grass stem!!"

I take the present opportunity to correct the unfortunate slip by which *Telipna reticulata* is quoted in place of *Alaena reticulata*, in Proc. Ent. Soc., 1916, p. cxxv, l. 4, and in the footnote. Furthermore, comparison with the ♂ type of *A. reticulata* in the British Museum proves that Capt. Carpenter's specimen does not belong to this but to a species at present undetermined.

" *Hesperidae*. Are fairly abundant. One (! *Surangesa*) is new to me. Of dark mottled grey, it rests on the bare granite rock, flat, with wings outspread like a Geometrid, and is as equally procrystic as the moths on bark. I have sent one or two specimens."

An example of *Surangesa motoroides*, Hdl., Nov. 7. 1917. bears a note similar to the above. Four examples of *Eggris jamesoni*, E. M. Sh., of July 26-27. 2 of Aug. 1, and 1 of

Nov. 5 are the yellowish dry-season forms; while 2 of Nov. 5-9, and 3 of Dec. 26-31 are the black-and-white wet form. Of these latter a pair taken *in cop.* on Dec. 26 were resting with expanded wings on the under side of a large leaf.

Among the moths collected at Lulanguru was a most interesting series of individuals hitherto regarded as belonging to four different species of the Pterothysanid genus *Hibridus*. The occurrence of all together in the same locality, and almost certainly on the same small kopje top, strongly confirms the conclusion at which Sir George Hampson has arrived, that all are forms of a single species. Of the 11 moths—all taken Dec. 1-31, 1917—3 are white males (*porus*, Druce); 3 are white but strongly veined males (*venosa*, Kirby); 3 are Acraeoid females (*craushayi*, Butl.); 1 is the form with orange-ochreous hind-wings like *craushayi* but fuscous fore-wings with a white subapical bar (*ansorgei*, Kirby). On this Capt. Carpenter had noted "On wing incipient *Aletis* or *chrysippus* mimic." The eleventh specimen is an interesting variety of *ansorgei* with a rich orange-ochreous subapical fore-wing bar.

"After butterflies come moths, and that brings me to the subject of *insects which come to light*. Moths are almost the only things that *don't* come here—I have never seen so many insects at light. The most curious feature is the predominance of different families—or even species—on different nights. Sometimes the table is covered with wood-borers of numerous forms; on other nights quite small *Carabidae*; then large and annoying *Melolonthidae* predominate; on another night *Elateridae*, sometimes large, sometimes small; then small *Melolonthidae* or *Copridae*, *Mantidae*, *Blattidae*, *Myrmecoleonidae*, a few *Diptera*, *Hemiptera*, *Longicornia*, *Weevils*, water beetles of different groups, *Gerris*. Quite large and very odoriferous *Carabidae*, *Cicindelidae*, and even a beautiful Dragonfly and large Cicadas have all come. Perhaps on one night several species of an insect will come which is never seen again. Indeed Crustacea, Myriapoda, and Arachnida are almost the only Arthropods that have not been attracted! Consequently I have made a large collection for the Brit. Mus., and send you duplicates whenever possible. I have

not yet been able to ascertain exactly what constitutes a "good dudu night," but it must be calm and warm, and I think unsettled: a clear starlight night is not so good. How interesting it would be to make huge collections every night and correlate the different groups with minutely recorded meteorological data!

"Now a few other observations from my journal.

"*Attractiveness of exudate from trees.*—On Nov. 11 and a few days before and after I noticed a minute moist patch about a centimetre square on the bark of a tree which was very attractive to Hymenoptera and *Charaxes*. I caught three specimens of brilliant green *Ampeliciinae* of at least two species, in succession, and *Pompilidae* also frequented it. It was presumably caused by a fungus disease. Another day a very sickly-looking stem of a sapling about 3 feet high was so attractive to *Charaxes* that half a dozen specimens of different species visited it at once, and probed it eagerly with the proboscis. After a day or two it proved less attractive, but some fine *Cetoniidae* came to it: when *gum* began to exude it was no longer attractive.

"*Mutilloid Spider.* I sent you a year ago from Ndala a Mutilloid spider [see p. xcvii], and now send a second specimen like the first, with red thorax and black abdomen with four large white spots. As in the first instance, it momentarily deceived me as it ran along in a very Mutilloid manner. But when alarmed it scurried away in a typically spider fashion.

"*Amnophila lugubris*, Gerst. I sent you some notes on a very unskilful or inexperienced specimen of this Fossor from Ndala, about a year ago [Proc. Ent. Soc., 1917, pp. xlii-xliv, where the specimen is referred to *beninensis*, Pal. de Beauv.]. A species which seems the same is common here now. On Nov. 26, on the kopje, as I strolled along, watching for butterflies, I saw on a low shrub at my feet one of these *Amnophila* behaving in a very curious manner. It was straddling a small stem and every now and then excitedly grasping it in its mandibles, as if it were a caterpillar. The reason for this was soon seen, for after a few minutes she flew to the ground at my feet and picked up her larva, which

she had dropped as I approached. This little point (grasping the stem) is most illuminating, as showing how the several acts are but links in a mechanical chain: the operations had arrived at a point when the impulse to *grasp something* in the mandibles was overwhelming. Having picked up her larva she carried it belly upwards, holding it at about the 4th or 5th segment, so that its anal extremity projected upwards in the air behind her, and walked with it for about 20 yards, keeping a wonderfully straight course among stones and tufts of grass. She then turned at a right angle and went on for another 10 yards, and then quite suddenly, as if certain of her whereabouts, put down the larva on a small clear space and began to take away the minute pebbles in her mandibles. I could see no difference from the surrounding soil, but the burrow was there right enough, for she very soon disclosed its mouth by removing a clod of earth, and went down, came up again, went down backwards, seizing the larva (a smooth Noctuid) by one extremity (probably anterior, but I forgot to take especial note), dragged it in: then after a short pause for oviposition came out again and started filling up the hole in the usual way, when I bottled her for identification. If she is the same species as the Ndala one she affords the greatest possible contrast in skilful working. [Mr. Rowland E. Turner has carefully compared the two specimens and finds that they are the same species, which he thinks should be placed under *lugubris*, Gerst., until the relation between this and *beninensis*, Pal. de Beauv., is satisfactorily cleared up.]

"On the evening of Dec. 5th I saw in a shed another specimen of apparently the same species, which I failed to secure. She brought her larva (rather a smaller Noctuid larva than those above recorded) into the hut and started opening up her concealed burrow. Having disclosed it she took out one or two small clods of earth and went down, and reappeared with a Noctuid larva (of the same size as the one she had just brought), which was rather unusually wriggly at its hinder end. She brought out a little more earth from the burrow, and then turned to this latter larva and apparently decided it was too lively, for she proceeded

to massage it systematically with her mandibles from end to end, passing from tail to head. Twice she left off for a moment to push her face along the dusty ground, as if to clean her mandibles from something that soiled them, although she certainly had not broken the skin of the larva. I have never seen a *Pecora* do this before. Eventually she put the larva down with its head at the margin of the burrow, went down backwards, seized the larva by the neck and dragged it down, came out, went down and came up again with a little more earth, did this twice again, and then dragged down the larva which I had seen her bring in. My attempt to bottle her failed. I had no net with me, and as I was due at the hospital for the evening round I couldn't wait for her return. But I'm sure she was of the same species as the last. It's interesting that she was using two medium-sized larvae instead of one larger specimen.

" *Courtship of Diptera*.--The courtship of *Asilidae* which I have witnessed several times is an interesting performance. The species referred to was almost certainly a *Promethes*. The ♀ sits as usual on a prominent bare twig, and the ♂ hovers in the air like a Syrphid, a few inches away on her right or left front and a little above. His energies are apparently directed to pleasing the lady by his hum: the pitch gradually rises, and as it does so he no longer remains stationary but oscillates slightly up and down, and then, just as the situation gets very exciting, the ♀ suddenly dashes away and the ♂ after her. Sometimes she settles again and the whole process is repeated, but I have never seen the actual union. One very often sees pairs united end to end: at other times the ♂ is on the back of the ♀, who often has her proboscis embedded in some prey [see *Trans. Ent. Soc.*, 1906, pp. 366-68], but whether the latter position is previous or subsequent to the former I do not know.

" In another group of flies, *Bombiliidae*, the ♂ also endeavours to please by his hum: in this case I have caught a specimen for identification [a ♀ *Ecoprosopa clata*, Lw.]. On Nov. 29th I first saw this. It is a species which keeps close to the ground, on which it often settles. On this occasion I saw one, presumably the ♀, sitting on the ground

while the other slowly circled round her, slightly above, making a most peculiar hum in which there was something of the rattling noise made by the large 'clockwork' *Pompilidae*, but can be best described as like the noise of an aeroplane heard fairly high up. Here again the ♀ darted off just as things got exciting. I saw another couple on a subsequent day, and was very anxious to net the hummer to prove it was a ♂, but I couldn't get it apart from the other. I noticed on the second occasion that the sitting specimen vibrated its wings slightly also.

"*Chlamys marshalli*, Jac. (*Chlamydinae*, allied to the *Ceryphalinae*). On Dec. 3rd I got a most curious beetle which I am sure is specially procryptic. It is a small, square, solid little insect with no limbs or antennae visible, and no constrictions visible between head and thorax or thorax and abdomen. It is of a greenish brown colour with rough integument. It was sitting on a vertical stem, closely apposed to it, and when I saw it I thought, 'Why does that caterpillar excrement remain on a vertical stem?' For that is precisely its appearance. It was not till I examined it very closely in my hand that I realised it was a beetle, and had it been resting on a horizontal leaf I should certainly have looked for a large caterpillar! I hope you will find it in the box and identify it.

"One more observation—quite a small one, but rather a curiosity. I was at a flowering shrub visited by many Hymenoptera, among them one of the large 'clockwork' black *Pompilidae*. It flew high over my head, but as it went about was closely followed by some half-dozen smaller black Hymenoptera, that might have been *Scoliidae*, just as small birds mob a big one. I can give no explanation, and am much puzzled by it.

"Jan. 1, 1918. Lulungara.

"With reference to this box, No. 5 [containing Lulungara captures of Dec., 1917], there are in it some nice, small Braconoid and Lycoïd Longicorns, the former of which have absolutely deluded me in the field! I watched one quite a long time flying among some twigs and said to myself, 'Ah!

are the Braconid which the last Braconoid which deceived me mimicked ! ' and, lo and behold, it was again the Longicorn in my net ! "

Capt. Carpenter's collection, especially from Lulanguru, contains many interesting additions to the great Lycoid combination described and figured by Dr. Marshall from Salisbury, Mashonaland (*ibid.*, pp. 515-18, pl. xviii, figs. 1-52). The abundance of the central models at Itigi was well shown by the capture of 272 *Lyceidae* belonging to 9 species, on a single plant on Mar. 23, 1917 (Proc. Ent. Soc., 1917, pp. lvii-lxix). These 9 species only contained 2—*Lyceus ampliatus*, F., and *rostratus*, L., and these in relatively small numbers of the species figured by Dr. Marshall. The mimetic species, of which a list is printed below, are all different from Dr. Marshall's except *Amphidesmus analis*, and the 3 species of *Dirphya* (*Nidocris*); and upon the mimetic relationship of these last Capt. Carpenter sheds new light. The locality is Lulanguru and the year 1917, unless otherwise stated.

DIPTERA (*Tachinidae*).—*Paraclara magnifica*, Bezzi., Dec. 25. "Mimetic of Lycoid Fossor." Also taken in the Ruanda Country, 30° 35' E., 2° 10' S., on June 8, 1916, when a similar note on the resemblance was recorded.

LEPIDOPTERA (*Tineidae*).—*Oedematopoda princeps*, Z. (allied to *Hyponomeuta*), Dec. 17 and 19. "Lycoid at rest" noted on both specimens.

HEMiptERA (*Capsidae*).—*Lygidocoris mimeticus*, Reuter and Poppius, Nov. 21 and 26. "Beautifully Lycoid on wing" and "Very Lycoid at rest" are the respective notes.

HYMENOPTERA (*Larridae*).—*Nalagonia bembesiana*, Bisch., Jan. 14, 1917, Ndala. "Lycoid Fossor." Mr. R. E. Turner informs me that this species bears a close resemblance to a much commoner and more widely ranging Fossor, *Liris haemorrhoidalis*, F.

HYMENOPTERA (*Tenthredinidae*).—*Hylotoma* (*Arge*) *auridipes*, Klug, Nov. 21 and Dec. 4. "Lycoid at rest" on both.

The Hymenoptera Parasitica are considered later, as Capt. Carpenter shows that they play the part of models as well as Lycoid mimics.

ColeoptERA (*Cetoniidae*).—*Gilgyphana* (*Hametis*) *balteata*,

de G., Dec. 3. "Lycoid." This mimetic resemblance and the association with *Lycidae* in life was noted by Dr. Longstaff and Dr. Dixey ("Butterfly-hunting," pp. 237, 238, 241).

COLEOPTERA (*Telephoridae*).—*Ichthyurus* sp., Dec. 6 and 13. No note is added to this species, but I think there is no doubt that the pattern is Lycoid, although the colouring of the anterior parts is rather too bright and yellow for a perfect resemblance. It is possible that the insect is Braconoid on the wing.

COLEOPTERA (Longicornia. *Cerambycidae*).—*Amphidesmos analis*, Oliv., Dec. 23. "Sitting on grass-blade very Lycoid." Included in Dr. Marshall's list and shown in his pl. xvii, fig. 25.

COLEOPTERA (Longicornia. *Cerambycidae*).—*Apiogaster* or genus near it, not in the British Museum Collection, Dec. 24. "Beautifully Lycoid at rest," in spite of the fact that the head and thorax are entirely black as well as the apices of the elytra.

COLEOPTERA (Longicornia. *Lamiidae*, *Phytacinae*).—*Mytrocnemis bicolor*, Auriv., Dec. 24. "Very Lycoid." In this beetle, as in *Glycyphana balteata*, the Lycid pattern is reversed, being black anteriorly and orange-ochreous posteriorly. Capt. Carpenter's note that both these beetles are Lycoid confirms Dr. Longstaff's conclusion that this reversal probably does not detract from any benefit that the Cetoniid may derive from the likeness (*ibid.*, p. 238).

Capt. Carpenter brings evidence that the remaining Longicorns (all *Lamiidae*, *Phytacinae*) of this combination are Braconoid when flying although Lycoid at rest. Of the models for the two larger species *Dirphya* (*Nitocris*) *nigricornis*, Oliv., and *similis*, Gahan, only *Pseudobracon servillei*, Brullé, Dec. 5,—a Braconid in spite of its name—appears in the Lulanguru collection. It bears the note that the large *Dirphyas* in the same box "look much like this on the wing." The pattern of this model is that of *Phaneromeris* sp. figured by Dr. Marshall on his pl. xviii, figs. 44, 45, while the two Lulanguru mimics enclosed with it are represented in figs. 29 and 30. A ♂ specimen of *D. nigricornis*, Dec. 14, 1916. Ndala, bears the note "Most extraordinarily like Braconid

on the wing," while another ♂ of Nov. 29, 1917, and a ♂ *μ. similis* of Dec. 23 bear no special note, but are the specimens referred to in the label of the *Pseudobracon*.

A smaller *Dirphya* (*Nitocris*), of still greater interest, was also included as a Lycoid by Dr. Marshall, and represented as *Nitocris* sp. in his fig. 28. It appears to be still undescribed, although specimens from Damaraland, Nyasaland, and Untali exist in the British Museum. A ♂ of Dec. 17 bears the note "Caught on wing as a Braconid," and a ♀ of Dec. 24, with "Completely deceived me. Caught as a Braconid on wing." is probably the specimen referred to in Capt. Carpenter's letter of Jan. 1, 1918 (p. cxxxviii). The former specimen set with expanded wings shows that the distal black and basal pale orange-ochreous area of the elytra are continued on to the functional wings, which therefore bear a pattern. This is very rare in beetles, and Dr. Gahan and Dr. Marshall are as sure as it is possible to be without making a special study of the point that all the African *Lycidae* of this combination have uniform, dark lower wings. The appearance is clearly mimetic of *Braconidae* during flight, and affords the strongest confirmation of Capt. Carpenter's conclusions, with which Dr. Marshall tells me that he entirely agrees.

Since the above paragraph was written a specimen of each of the larger *Dirphyas*, *nigricornis* and *similis*, has been set with expanded wings, showing that in these too the elytral pattern is continued on to the functional wings. Furthermore, there were marked differences between the concealed patterns of the two specimens which may be characteristic of the species.

The most perfect models for the small *Dirphya* are doubtless Bracons with patterns like those shown on figs. 11-16 of Dr. Marshall's pl. xviii, and especially the two smaller forms represented in figs. 47 and 48. None of these were sent by Capt. Carpenter -although, as already mentioned, the *Pseudobracon* possesses a similar pattern -but he included a Braconid of the genus *Glyptomorpha*, Dec. 31, with a pattern like that of the Braconid and Ichneumonid represented by Dr. Marshall in figs. 59-61; also another smaller Braconid of the genus *Merinotus*, Dec. 17, with a less emphasised form of the same

pattern. These would doubtless serve as models when on the wing, but there can be no doubt that smaller species with the pattern of the *Glyptomorpha* exist in the locality where the *Dirphyas* were taken. Dr. Marshall shows in fig. 62 a Reduviid bug with the most wonderful mimetic likeness, at rest as well as in flight to the *Parasitica* of figs. 59-61.

From these last species of *Dirphyas*, Lycoid at rest, Braconid in flight, we pass to two species of the allied Lamiid genus *Oberca*, of which the first is doubtfully Lycoid, the second certainly not, being Braconoid at rest as well as in flight. Two males of the first, *O. sp.*, probably *ventralis*, Gahan, taken Nov. 22 and Dec. 26, both bear notes recording that they were "caught on the wing as Braconids"; a third male of Jan. 1, 1918, was "very Braconoid on wing." The pattern is very similar to that of the *Dirphyas* save that the anterior orange-ochreous is so much reduced that any direct mimetic likeness to the *Lycidae* is doubtful, although a place on the outskirts of this dominant combination is probably advantageous. In the second species *Oberca sp.* very near *scutellaris*, Gerst., ♂, the pattern is similar but the anterior colouring red instead of orange-ochreous, bringing about a close resemblance, especially on the wing but also at rest, to the black and red *Braconidae*. The beetle was "taken for Braconid on wing," the model, a species of *Iphiaulax* near *coccineus*, Brullé, being sent with it, both captured Apr. 15, at Itigi. Three species of *Braconidae* with this pattern, including *coccineus*, together with the mimetic *Oberca scutellaris*, Gerst., and Reduviid bug *Callilestes bicolor*, Dist., are described and shown by Dr. Marshall on p. 533 and in his pl. xviii, figs. 53-58.

The resemblance of Bornean Longicornia to *Braconidae* is dealt with in detail by the late Mr. R. Shelford, who gave a list of 12 species of *Phyllacinae*, including 9 *Oberca*s, that are mimetic in this way (Proc. Zool. Soc., 1902, pp. 238-40).

The next letter, written in January from Dar es Salaam, gave an account of a visit to Lake Tanganyika after Capt. Carpenter had been relieved from his post at Lulunguru:—

"Here I am at last in Dar es Salaam, with, so far as I

can see, no prospect of getting home until months after all activities have come to an end. It's not in any way an attractive place, and every one dislikes it. I am in charge of the West African section of the huge carrier hospital here, and shall apparently remain so. I *may* get some local leave, but no home leave is being given. I arrived here on Jan. 15th after a most enjoyable week visiting Tanganyika, and think the Entomological Society might like to hear something of the lake, so I write this account.

Having been relieved of my last job I obtained unofficial leave to be absent for a week, and left Lulungu at 7 p.m. on Jan. 3rd in a very comfortable, first-class coach, and at daybreak found the train just beginning the descent to Tanganyika, among hills well wooded and interesting, because all the vegetation seemed different from that at Lulungu and also from that around L. Victoria. I noticed Bamboos and what I took to be giant Lobelias, though of a species different from the one I had met at Kigezi. I saw, before it was really light, some huge dark animal moving away from the railway, which I took to be a Rhino, the first I have seen. Incidentally also it was the only Mammal I saw on the journey to Kigoma and back from there the whole way to Dar es Salaam, although one *night* was spent in travelling—rather a remarkable difference from the teeming herds of game to be seen from the Uganda Railway. Well, as we got nearer I saw the lake in front of and below us, very black and stormy-looking, with the mountains of the other side clearly visible; on our right, to the north, a rugged range of bare rocky mountains was flooded with golden light from the rising sun, and the whole effect was rather magnificent.

We reached Kigoma, which lies at the head of a well-sheltered bay, at 7.30 a.m. on the 4th. Though prettily situated it is not itself a pretty place. The northern coast is formed by low hills covered with green bush, affording a pleasing contrast with red soil and blue water. Most of Kigoma lies on the south side, so that there are no trees or bushes worth mentioning. There are only three large buildings: one a hotel and two Government blocks. At the south

side of the bay is a headland of a formation quite different from the north, consisting of small rounded boulders and large pebbles embedded in a loose matrix.

"Shortly after arrival I wandered along the shore and found numbers of the fresh-water jellyfish cast up on the sand, in diameter about equal to a florin or half-crown, and so absolutely colourless that I never succeeded in finding one in the water. I also found numbers—but all water-worn—of one species of the molluscs peculiar to Tanganyika, a large conical species some three inches in height, and a single specimen of a tuberculated shell like the marine *Nitidulites*. There were also single valves of *Lamellibranchia* with marine appearance.

"In the afternoon I was taken in the local car to Ujiji, which lies 7 miles south of Kigoma, the country in between all cultivated. I was much disappointed in Ujiji: as it is an old Arab settlement I had expected to find it picturesque, but it merely consists of great numbers of square mud houses, dirtily whitewashed, with thatched roofs, swarming with children. The famous meeting-place of Stanley and Livingstone in 1871 is marked by a block of concrete under an old, decrepit mango tree, formerly, at the time of meeting, on the shore. Owing to the shrinking of the lake, like the other African lakes, this point is now some 200 yards distant from the present actual shore, and I should think some 20 feet above it. Hence between 1871 and 1917 the lake has fallen 20 feet. When one realises that 6000 feet have been sounded without touching bottom (authority, Commander Thornley, R.N., in charge of our boats on the lake), one wonders what is happening that such a prodigious volume of water should fall in level at the rate of about 5 inches a year!

"On the morning of Jan. 5th I wandered along the shore of the bay looking for objects of interest, and got a fine *Cicindelid* [*C. regalis*, Dej., also *C. intermedia*, Klug] new to me. I may say here that almost all the beetles [including the Coprid *Onitis uncinatus*, Klug, ♂] and Hemiptera I saw were strange to me, also some moths, but the only butterflies seen were familiar. I obtained a few specimens from both

sides of the lake which may be of interest to the Entomological Society. On this morning I saw and obtained a fine Pompilid [*Psammochares icper*, Gerst.] quite new to me, apparently specialised for digging in very loose sand such as *Bembex* also loves, for, like *Bembex*, it had the fore-limbs set closely with large bristles much more abundantly than those of other Pompilids which dig in hard soil. It is obvious that a brush-like leg is much more suitable when the sand is soft and loose. This species, which I send you, is grey and black, with wings approaching the Lyeid coloration. I first saw it running quickly about, obviously searching for something, and soon it came to a spot where it scratched away a little loose sand and laid bare a spider, paralysed, and apparently *hidden away* until the wasp had found a suitable spot in which to bury it (this is a trait I have not met before among Fossors). The wasp then took it up and ran backwards with it for a good many yards, only occasionally turning round to negotiate a difficulty, until she came to the spot where the burrow had been previously dug; for she put the spider down, took away a lump of sand, and laid bare a very shallow hole into which she put the spider, without going down herself, and quickly covered it up with loose sand.

On the evening of the fifth I embarked on a small tug, which had done 12 years' service on the Congo, and was bound for Albertville, the port which the Belgians have made on the west side of the lake, where the Lukuga river, one of the main sources of the Congo, takes origin. Since the war began the Belgians have made this port and run a railway to it, so that now one can cross Africa from Dar es Salaam to the mouth of the Congo by rail and steamer alternately. This Albertville is a new place: the former Albertville (now known by its native name of Toa) lies some 20 miles northwards. After a night of oily calm I awoke just before dawn to find that we were passing the most prominent point of the western coast (which lies S.S.W. from Kigoma), -teaming between the mainland and a few small islands very close to the shore, rocky, and densely covered with bush, reminding me very much of islands of the type of *Ngumba* in L. Victoria.

The mainland has ranges of hills rising one behind another to a height of about 3000 feet, for the most part well wooded, but sometimes bare. Toa was soon passed—a few hours prettily situated on a low hill with its base lapped by the lake. Between this hill (which not long ago must have been an island) and the mountains is a stretch of flat sand overgrown with bushes: part is still under water, and forms a lake or lagoon which was used by Belgian hydroplanes in July, 1916, as a base from which they bombed the Germans out of Kigoma with great success. As we drew near the source of the Lukuga the coast became flatter, and there were long sandbanks. The river arises at such an angle with the lake that its source is almost invisible: it at once breaks back at a right angle and flows south for a bit before winding about in a westerly direction around the ends of the ranges of hills. It has no falls or cascades, but runs swiftly, being about as broad as the lower river at Oxford. The banks are well marked, and not concealed by beds of papyrus. I walked a mile or two along it, and was interested to see a train leave Albertville for the interior. I also collected a few insects, which I send you. [Among these were *Sphecx* (*Parasphecx*) *albisectus*, Lep.; *Bembex forcipata*, Handl.; *Chromatophania fenestrata*, Villen.; several specimens of *Pachytoma gigantea*, Illig.; and *Cicindela intermedia*, as on the E. of the lake.]

"We reached Albertville at about 9, and one's first impression was, 'Why, this is Tropical Africa.' It looked like the old pictures and engravings one knows so well—and quite quite different from the infernally dull bush country which seems to compose most of late German East Africa, and also different from, and more 'tropical' than, the Uganda shore of L. Victoria—partly, I think, because of the little steep tree-clad hills, and sudden deep little valleys with ferns at the bottom: and more palm trees than one is accustomed to see. We put off again at 11 and went back to Toa to pick up the P.M.O. It was a most lovely blue evening, full of colour, though no more so than Victoria Nyanza. I noted near the coast that the water in places was quite green, in streaks, like the patches of colour one sees in the Red Sea, except that the

latter are red—both presumably due to Algae. We came back to Albertville for the night, and slept on board, and I had a delicious bathe next morning.

“ On Jan. 7th we sailed along the coast southwards for 6 hours and returned to Albertville just after dark. As we got more southward the mountains became higher, though still forested, and their irregularity was interesting and beautiful. Opposite us on the east coast, forming the most marked prominence thereof, was a very fine rugged group of mountains, named Kongua, rising to 5000 feet, which through glasses appeared to descend sheer into the lake, and one could see deep ravines and marks of waterfalls. I wished we had been sailing along that side. At the end of our 6 hours’ run I got an hour ashore and secured a couple of Coprids, both new to me, under cow droppings on the sand. [*Liatongus planatus*, Cast., ♀, at Cape Tembwe; *Sisyphus crispatus*, Gory, ♂, at Tembwe Bay]. We had a very pretty pink sunset, and just after dark were met by a sudden thunderstorm which nearly sank the boat we had been towing, but it was secured alongside when the storm came on. It was quite a savage little storm and very noisy, and I was much interested, knowing so well the storms on Victoria!

“ Next day we returned to Toa, and sailed at 4 p.m. on our way back to Kigoma. For 4 hours we plugged against a heavy head wind and sea and got a good tossing—many on board (including a *real* sailor, superintendent of the lake ships) being sea-sick, but I much enjoyed the experience. These storms on Tanganyika are much feared by the native canoemen, who never go far from land, but their dug-outs are very poor sea boats compared to the fine built canoes on L. Victoria.

“ Now a few words about the differences between Victoria Nyanza and Tanganyika. Except for the fact that both contain fresh-water they are as different as they well could be. But even in the water there is a difference, because of the green areas of Tanganyika due to some Alga. The coast-line is very different—Victoria, comparatively ‘tame-looking’ with low, *flat-topped* hills, or marshes of papyrus—Tanganyika with high steep mountains, and no marshes, and very very

little papyrus, altogether wilder-looking. Victoria is shallow. I do not think its maximum depth reaches 600 feet, whereas Tanganyika has been sounded to 6000 feet without touching bottom. In shape, of course, they are very different, and herein probably lies the reason of the difference in depth. Tanganyika fills up part of a great rift, whereas Victoria is merely a huge rain-puddle. The well-known fauna of Tanganyika is, of course, very different. I secured shells like *Nassa*, *Trochus*, *Littorina*, but some of the most peculiar species have to be dredged for. Such fish as I saw being sold were totally different from the ones I know in Victoria. Curiously enough, during all the time I was on Tanganyika I saw and heard no signs of the great fish eagle (I believe its name is *Haliaeetus vociferans*) which is so conspicuous on Victoria, though I am told it exists on the lake. The flora seemed very different—very few of the common bushes on Victoria were noted on Tanganyika; and I saw many trees, shrubs, and flowers new to me. I wished I had had time to collect insects on the forested hills of the western shore. Some day I hope to return home by that route. From L. Tanganyika to Boma, the ocean port at the mouth of the Congo, I believe takes 20 days or so."

Among the specimens captured at Kigoma on Jan. 9 were a Fossor of the genus *Trypogylon* near *confrater*, Kohl. and the following Coleoptera:—*Oxytheca ritticollis*, Boh., *Laccoplera burrigera*, Boh., *Aspidomorpha parannaculata*, Boh., and *Mesoplatys ochroptera*, Stål.

" Mar. 1, 1918.

" I wrote to you last from Dar es Salaam that I was just off on a tour up-country again to tackle an outbreak of plague in a district named Singidda, N. of the railway and S.W. of Arusha. I have just returned to the headquarters of the Political Officer at the conclusion of the tour. Curiously enough, I never saw a case. The epidemic appears to have begun in mid-January, and there must have been about 100 deaths, but the people left the infected houses and bolted into the bush, so that the outbreak was more or less stayed (though I have heard of three more deaths in the district since I left it). I investigated about 112 deaths, of which

83 had definite symptoms of plague, others doubtfully plague, some probably anthrax. I have given about 750 inoculations, but could only do 'contacts,' since the population is very large and the vaccine very limited.

" It's a most glorious country—the tail end of the Great Rift Valley, with very little bush—nearly all a huge expanse of undulating grass-land with a little bush in the hollows, an escarpment each side (the valley being about 20 miles in breadth) of about 300 feet, I suppose, with clumps of granite rock cropping out along the top and here and there in the valley. To the N.E. could always be seen a fine conical peak rising, I suppose, about 3000 feet above the surrounding country, called Amang (? why?) by the Germans, Nguruwe by the natives of this part (Wanyaturu). It looks like a volcano, and is marked on the map as being clothed with primitive forest (ah-h-h!!!). But no chance of collecting there! This is a *very* disappointing country for butterflies—very few in species and individuals, but *Ngoehlu* is of interest, as I haven't seen it since I caught it in the bottom of the *other* rift (Kigezi!). But the paucity of butterflies is more than compensated for by thousands of water and wading birds congregated on shallow lakes which dry up in the dry season. Alas! I know so little about waders, but spotted Avocets and Flamingoes! I watched one of the latter feeding—he put his head under water in the well-known inverted position, and then proceeded to circle round his own head, which he kept under water until he had made two revolutions, then put it down again in the same spot and circled round it twice more, stepping sideways with trampling movements of his feet. I suppose this trampling squeezed out of the mud minute organisms which he strains out of the water like a whale. I could spend hours with glasses (and oh, for a cinema camera!). The birds are so tame you can sit down and watch them within 20 yards! Flocks of *Coots*, so that the water is black with them—which rather surprises me.

" I expect to return to Dar es Salaam shortly, and then get a month's local leave, and then have asked—mainly for Lepidopterous purposes!—to be sent to Portuguese East Africa!"

CAPTAIN G. D. H. CARPENTER'S PIERINES FROM LULANGURU AND ST. MICHAEL'S MISSION.—DR. F. A. DIXEY exhibited Capt. Carpenter's Pierines and made the following observations :—

The Pierines collected by Capt. G. D. H. Carpenter at Lulanguru, seventeen miles W. of Tabora in East Africa, are in several respects of great interest. The most noteworthy captures are as follows :—

(1) A series of *Teracolus ducissa*, Dognin, consisting of five males and seven females, including one pair taken *in cop.* This pair settles the question of the male of *T. ducissa*, which has been erroneously stated to be like the female. In reality it bears considerable resemblance to the male of *T. subfasciatus*, Swains., from which it is chiefly distinguishable by the fact of the dark subapical bar of the fore-wing being continuous into the hind margin, and the included apical ground-colour being of a deeper orange. Aurivillius in Seitz, "Macrolepidoptera of the Ethiopian Region," p. 61, describes the male of *T. ducissa* as differing only from the female by its yellow ground-colour. His figures of the sexes (*ibid.*, pl. 20, f, g) really represent two females; but the same plate contains a figure of "*subfasciatus* ♀," which may very well have been drawn from the male of *T. ducissa*. My attention was called to this by Prof. Poulton.

(2) A long series of *Teracolus casta*, Gerst., comprising twelve males and seventeen females; twelve of the total number were taken paired. The males are mostly of the large dark-bordered form called *sipylus* by Swinhoe. The females show a remarkable range of variation.

The captures range in date from July 25, 1917, to Jan. 2, 1918. Capt. Carpenter notes that the wet season began from the end of November. In most of the species there is a well-marked correspondence with the change in meteorological conditions. This is evident in the case of the three species of *Terias*, *T. brigitta*, Cram., *regularis*, Butl., and *senegalensis*, Boisd., though not without some exceptions. The specimens of the first-named species were caught July 25–Aug. 1, and are all of the dry-season form, the males being somewhat transitional, and the females, as is usual, having the dry-season character more strongly

developed. The *T. regularis* caught in July are "dry," though not markedly so; those captured from Nov. 23 to Dec. 10 show a gradually increasing wet-season coloration. July examples of *T. hecate* are "dry"; a December male is transitional, but a female captured on Dec. 31 is conspicuously "dry." On the other hand, a pair taken on Jan. 1 is "wet" in both sexes. In *Teracolus regina*, Trim., the dry-season character is maintained in July. In December and January it is replaced by the wet. Not much seasonal difference is observable in *Catopsilia florella*, or in *Teracolus ducissa*; in *T. casta*, however, the change is marked. The dry-season character prevails throughout July; in October it begins to yield; from November to the following January the wet-season coloration is fully established. The specimens of *T. achine* were taken in December; they are all of the full wet-season phase. The same applies to the single example of *Teracolus annae*, Wallgr. (caught in November). Two July specimens of *T. eris*, Klug, are "dry," the remainder (November and December) are "wet." *Belenois sercerina* (July) is "dry." Other forms of *Belenois* I reserve for treatment on a future occasion.

Another consignment of Pierines from Capt. Carpenter comes from St. Michael's Mission, in Lat. 32° 45' E., Long. 3° 45' S. The earliest date for these specimens is Aug. 21, the latest is Oct. 12. Capt. Carpenter notes, "Dry season till light rains in early October."

The *Teracolus callidia*, *T. incertus*, *T. eragone* and *T. achine* were all taken in August, and in all the dry-season character is well marked; as it is also in *T. ecarne* and *T. annae* (October), *Terias brigitta* (Aug. and Sept.) and *Belenois gidica* (Sept. and Oct.). The August and September *Teracolus rogersi* are "dry," the October specimen is "wet." All the *T. casta* except one ♀ were captured in August. The latter (Oct. 8) shows an approach to the wet-season phase; the remainder are all "dry." It will be seen that in this series of Pierines the correspondence of seasonal phases with Capt. Carpenter's note of seasonal conditions is remarkably close, so far as the material goes. The "light rains" that began in early October are immediately accompanied by a slight but

distinct change in *Teracolus rogersi* and *T. casta*; in other cases they have not, up to October 8, produced any perceptible effect.

Nuptial Flight of Pierines.—It may be remembered that in Proc. Ent. Soc. Lond., 1917, pp. liii, liv, a number of cases were recorded in which paired specimens were taken by Capt. Carpenter, the male in every instance but one supporting the female. Since then many more pairs have been sent home by Capt. Carpenter from the same locality (Itigi) as before: and in addition to these, further examples from Lulanguru. The following is a list of all the Pierines actually captured in the paired condition by Capt. Carpenter, including those mentioned in the communication above referred to. It will be understood that in every case the paired specimens themselves have been sent home by Capt. Carpenter, and may be seen in the Hope Department.

<i>Teracolus casta</i> , Gerst.	17 pairs
<i>T. evagore</i> , Klug	1 pair
<i>T. ducissa</i> , Dogn.	1 pair
<i>T. achine</i> , Cram.	3 pairs
<i>Herpocenia eriphia</i> , Godt.	1 pair
<i>Pinacopteryx simana</i> , Hopff.	35 pairs
<i>Belenois gidica</i> , Godt.	1 pair
<i>B. mesentina</i> , Cram.	10 pairs
<i>B. serrina</i> , Cram.	8 pairs
<i>Terias regularis</i> , Bntl.	1 pair
<i>T. senegalensis</i> , Boisd.	1 pair
<i>Catopsilia florella</i> , Fabr.	2 pairs

Eighty-one pairs in all.

Inasmuch as (except in one pair of *P. simana*) the female was invariably supported by the male, it may, I think, be concluded that this is the general rule in the subfamily Pierinae.

SPECIES OF *HELICONIUS* FROM FRENCH GUIANA. --Mr. W. J. KAYE, on behalf of Mr. J. J. JOICEY, exhibited a very fine series of named forms of *Heliconius melpomene* and its companion species *Heliconius erato* from French Guiana. One or two remarkable new forms of the former and a number of

the form *tellus* of the latter were not present in a former large collection from the same locality two years ago.

MONSTROSITY IN *LEPTOTHORAX ACERVORUM*, F. —Mr. DONISTHORPE exhibited a very remarkable monstrosity of an ant. which had been sent to him by Mr. R. Butterfield of Keighley, who had taken it on April 26, 1918, in a mixed nest of *Myrmica ruginodis*, Ny1, and *Leptothorax acervorum*, F., at Mauley Bog, who suggested it might be a parasite. Mr. Donisthorpe pointed out that it was a monstrosity of the *Leptothorax*, being a small dealated ♀, but unlike all the Myrmicine ants, it only possessed one very small joint joining the epinotum to the gaster, instead of a pedicel of two joints, the petiole and post-petiole.

He also exhibited a specimen of *Elater sanguinolentus*, Schr., taken on Wimbledon Common, May 28, 1918. He said that when hunting for bees, etc., for Mr. Morice, he noticed this beetle in some numbers, and as far as he was aware it had not been taken on Wimbledon Common for twenty-five years.

ABERRATIONS OF BRITISH RHOPALOCERA.—The Rev. G. WHEELER exhibited a specimen of *Parage megera*, L., ab. *medialugens*, Fuchs, taken at Guildford on May 31st, and observed that it was the first time he had met with this form either in England or abroad. All the specimens of this species met with on this day were unusually dark. He also showed a fine specimen of the brassy aberration *intermedia*, Tutt, of *Rumicia phlaeas*, L., taken at the same time and place.

METHOD OF FORMATION OF "CUCKOO-SPIT," BY *PHILAENUS SPUMARIUS*.—The PRESIDENT said that, as the nymph of *Philaenus spumarius*—the common "cuckoo-spit" insect—was now very abundant, and specimens for observation were easily obtainable, he wished to call attention to a remarkable peculiarity in its abdominal structure, which he had noticed when examining the insect a few days ago, and to which he could find no reference in any of the text-books or other works he had had time to consult. The peculiarity consisted in the fact that the tergites and pleurites of the abdomen from the 3rd to the 9th, instead of ending as usual at the sides to form lateral edges, are curved round and continued under-

neath the abdomen as membranous extensions, which meet in a suture along the middle line, or sometimes even overlap one another. Between them and the true ventral surface of the abdomen a cavity is formed which is filled with air; and it is into this air-chamber that the spiracles open. A median triangular lobe arising from the sternite of the 2nd segment fits in between the lobes of the 3rd segment, and together with a ridge extending from it on each side, closes up the air-chamber in front. Air can be admitted to, or expelled from, the chamber by means of a Y-shaped slit or valve, formed where the lobes of the 9th segment and the anal lobe come together. Fabre in his account of the froth insect ("Souvenirs," 7th Ser. 1900) had noticed this Y-shaped slit at the end of the abdomen, and correctly observed that it was by means of this valve that it blows its bubbles; but this was about the only accurate observation in his account, which for the rest must be treated as mainly conjectural or imaginary. Kershaw, in a paper in "Psyche" for 1914, had described the structure of the abdomen in the case of another species of Cercopidae, but whether for the first time or not, he was at present unable to say. Kershaw, however, maintained that the air which fills the bubbles was expelled along with the liquid from the alimentary canal, thus upholding the view which has been generally accepted since the time of De Geer; and he believed that the chief function of the air-chamber was to keep the spiracles from being clogged by the froth which surrounds the insect. The President said he was convinced from his own observations, confirmed by those made by Mr. F. Muir at his invitation, that there was no air mixed with the liquid as it issued from the anus; that the air with which the bubbles of froth were blown was forced out from the air-chamber beneath the abdomen through the Y-shaped slit at its end. Glands at the sides of the 7th and 8th abdominal segments from which tufts of white filaments extend had been variously interpreted, Berlese considering them to be the source of the liquid secretion, and Prof. Porta as a combination of wax-glands and tracheal gills; but as he found that the white tufts were completely dissolved in ether, he believed the glands were simply wax-

glands, though possibly they might secrete something of a mucilaginous nature that gives coherence to the froth. He hoped some of the Fellows present would take the opportunity to make observations on the insect with a view to confirming or disproving the account he had just given.

[Since the date of this meeting, I have found that a full account, agreeing in all essential respects with my own observations, was given by Dr. Karel Šulc in *Zeit. für Wissen. Zool.* Bd. 99, pp. 147 *et seq.* (Nov. 1911).— C. J. G.]

BOTH SPECIES OF *HEMARIS* FROM THE NEW FOREST. —Mr. HAMILTON DRUCE exhibited about 30 specimens of *Hemaris tityus* (*bombyliiformis*) and *H. fuciformis*, which he had taken near Brockenhurst on May 18th, 19th, 20th, and remarked that the extensive wood cutting in the Forest had not depleted their numbers.

Papers.

The following Papers were read:—

"Studies in Rhyncophora, iv; a preliminary note on the Male Genitalia," by DAVID SHARP, M.A., M.B., F.R.S., etc.

"Notes on the Ontogeny and Morphology of the Male Genital Tube in Coleoptera," by FREDERICK MUIR, F.R.S.

"Notes on various Species of the American Genus *Astylus*, Cast. (Coleoptera), with Descriptions of their Sexual Characters," by G. C. CHAMPION, A.L.S., F.Z.S.

"New Staphylinidae from Singapore, pt. ii," by MALCOLM CAMERON, M.B., R.N.

Wednesday, October 2nd, 1918.

Dr. C. J. GAHAN, M.A., D.Sc., President, in the Chair.

Alteration of Bye-law.

The proposed alteration in Bye-law viii was read for the second time.

Exhibitions.

LIFE-HISTORY OF *LYCAENA ALCON*. —Dr. CHAPMAN exhibited a bred specimen of *Lycaena alcon*, probably the first specimen

that has been bred, certainly the first from larvae taken in the autumn, and made the following observations :—

The life-history is interesting as parallel to, but differing from, that of *Lycæna arion*. The young larva feeds in the autumn in the flowers and other portions of *Gentiana pneumonanthe*, and probably of other Gentians. So far it is exactly parallel in growth to other Blues, such as many of our Plebeids that pass the winter in the third instar; when it reaches the third instar it leaves the plant, wanders off, and, hitherto, efforts to carry it further have failed. At this point it agrees with *L. arion* in habits, but it is not like *L. arion*, which is in a remarkably modified and concentrated (as regards skin armature) fourth instar, but is in quite an ordinary third instar. In its plant life it has differed also in that several, often five or six, larvae live amicably in one flower, whereas *L. arion* is solitary, and if by any accident two larvae meet, as by a second egg having been laid on the same flower-head, or especially when incautiously associated in captivity, they are inveterate cannibals.

The remaining history is that both *arion* and *alcon* live in the nests of ants—I kept both species in those of *Myrmica scabrinodis*—and pupate in the nest (re *L. arion*, teste Capt. E. B. Purefoy). The differences are that *L. arion* eats the ant brood, whereas *L.alcon* certainly sucks their juices without eating them, and I could not prove that it ever actually ate them, though I thought it did so when past the winter, when its food would more often be ant pupæ.

L. arion is in its fourth instar, and provided with a skin armature not unsuitable to it when full grown. *L.alcon* has only a third-instar armature, and when full grown might almost be described as without one, for, like *L. arion*, it does not moult after entering the ants' nest, but attains its full growth still in the third instar. The skin is then so attenuated that the fat-masses are very obvious, and its general aspect is like that of an internal feeder rather than that of a butterfly. It is to be noted as exceedingly remarkable that a butterfly larva should attain its full growth after only two moults.

Monsieur Oberthür, who is familiar with localities where *L.alcon* is common, and considered it highly probable that it

had a history similar to that of *L. acron*, and who with the assistance of Mr. H. Powell found that ants would carry off the larva of *L. alcon*, and that it would lap up the juices of wounded ant larvae, provided me with the young larvae for observation, in both 1916 and 1917, and my success in rearing the insect is entirely due to his initiative.

My detailed notes have been sent to him to appear in the "Études de Lépidoptérologie comparée."

Mr. Powell has seen the larva of *L. alcon* carried off by *Tetramorium caespitum* and by *Tapinoma erraticum*. Acting on this hint Mr. Donisthorpe provided himself with a nest of *Tetramorium*, and now has a larva of *L. alcon* thriving in it. I have larvae in nests of *Myrmica scabrinodis* and *M. lacerinodis*.

AN OUTDOOR SPECIMEN OF THE COCKROACH. Mr. DONISTHORPE exhibited a specimen of the common Cockroach (*Blatta orientalis*) taken under bark of oak in the New Forest, far away from any houses, July 29th, 1918. Dr. NEAVE and the PRESIDENT commented on this exhibit.

ERGATANDROMORPH OF MYRMICA SULCINODIS. Mr. DONISTHORPE also exhibited a curious ergatandromorph of *M. sulcinodis* taken on Bloxworth Heath, from the collection of the late Rev. O. Pickard, Cambridge.

LARVAL SKINS OF DYTISCUS MARGINALIS. Mr. HUGH MAIN exhibited the three larval skins of *Dytiscus marginalis*, prepared for demonstration purposes. Ova were deposited in captivity about the last week in May of this year. The larvae hatched on June 4 and 5. The first moult of one of the larvae took place on June 13, the second moult on June 28, and the pupa was disclosed on July 28. The other larvae passed through the same stages round about the same dates. The empty larval skins were floated out and spread on glass under water, and after drying were mounted up with a cover glass like a lantern slide, strips of cardboard being inserted to prevent pressure on the specimens.

EXPERIMENTS IN COLOUR-INHERITANCE IN PEDICULUS HUMANUS.—Mr. BACOT, in referring to some breeding experiments he had conducted respecting the inheritance of dark and light coloration in *Pediculus humanus*, explained that his results, which were of an indefinite character, were com-

pletely valueless owing to the discovery by Sikora that the insects reacted phototropically to the light or dark hue of their surroundings. It appeared that the factors necessary to the production of dark pigmentation were exposure in some earlier instar to light while in a dark environment. Individuals kept in complete darkness did not react. In his experiments a strain of lice which showed only pale greyish forms during the first three or four generations then commenced to produce dark (so-called melanic) individuals, presumably owing to the white sides and grey flannel in the box having been blackened with excrement by the insects during this period. With regard to the lengthy series of breeding experiments he had carried out the results curiously simulated some features of discontinuous variation, suggesting Mendelian inheritance in which the proportion of dark and light forms did not conform to theory. It appeared, in view of Sikora's discovery, that this was to be accounted for by the chance exposure to light of susceptible larvae or nymphs while amid dark surroundings during examination; the small glass-bottomed boxes in which the broods were reared being normally carried wrapped up in paper in a vest pocket, where little, if any, light could penetrate. The nature of the darkening was apparently twofold: (1) dependent upon the pigmentation of the chitinated plates, and (2) to the suffusion of the general skin surface. His own results suggested that, while the first character might be present without the second, the second was always accompanied by the first.

Paper.

The following paper was read, the author illustrating his subject with photographs shown in the epidiascope.

"Notes on Australian Sawflies, especially 'Authors' Types' and the Specimens in the British Museum of Natural History and the Hope Collection in the Oxford University Museum, with Diagnostic Synopses of the Genera and Species," by the Rev. F. D. MORICE, M.A., F.E.S.

Wednesday, October 16th, 1918.

Dr. S. A. NEAVE, M.A., D.Sc., F.Z.S., Vice-President, in the Chair.

Tea Fund.

The TREASURER having brought forward the question of subscriptions to the Tea Fund, a discussion took place during which the question was raised whether it would not be better for the Society to provide tea as one of its regular expenses; a charge for tea was also suggested. Eventually it was agreed *nem. con.*, on the motion of Mr. E. E. GREEN, seconded by Mr. H. ROWLAND-BROWN, that the question be referred back to the Council.

Alteration of Bye-law.

The proposed alteration in Bye-law viii was read for the third time, and it was announced that the Special Meeting would take place immediately before the Ordinary Meeting on Nov. 6th, at 8 p.m.

A RARE COCCID.—Mr. E. E. GREEN exhibited specimens of a rare Coccid (*Kermes quercus*) taken on the stem of a single oak, at Selby (Yorkshire). The species had been taken on two or three occasions only, apparently in the London district. The present examples were found to be associated with dense groups of adventitious buds on the stems of the tree, and were extraordinarily like the buds themselves.

EUPITHECIA HELVETICATA VAR. ARCEUTHATA AND A LIVING LARVA. —Mr. W. G. SHELTON exhibited specimens of *Eupithecia helvetica* var. *arceuthata* Frey, and a living larva from Surrey, and made the following observations:

E. helvetica, var. *arceuthata* has been known for many years to occur locally in the south of England. It was discovered so far back as 1862 by Harper Crewe, who in this and the following year seems to have secured a number of larvae. Specimens are said to have since been taken in Surrey, but the only definite record seems to be one by B. A. Bower in E.M.M., vol. x. (2nd series) p. 42, who records two examples beaten

from Juniper from the neighbourhood of Croydon; the other supposed specimens have turned out to be *E. satyrata* (cf. "South British Moths," vol. ii, p. 230).

It seems to be exceedingly scarce in collections, the only specimen purporting to be this form that I have seen is one which was in the collection of the late C. A. Briggs, and which I purchased at his sale; this is certainly not *E. var. arceuthuta*.

In 1915 a friend informed me he had beaten two green *Eupithecia* larvae from Juniper in Surrey, and in the following year bred two undoubted examples of this variety therefrom. In 1916, my friend having kindly given me the locality, I obtained six larvae, from which I bred three examples. In 1917 thirteen larvae were obtained, from which, however, only three more imagines resulted; whilst this year I could only obtain four larvae.

It will thus be seen that *E. var. arceuthuta* seems rare, at any rate in Surrey, and it is also exceedingly local, for all my larvae have been obtained from one small group of Junipers, although these shrubs are plentiful in the district.

Mr. KAYE and the Rev. F. D. MORICE commented on this exhibit.

NEW SUB-SPECIES OF *HELICONIUS ERATO*.—Mr. W. J. KAYE exhibited a remarkable new form of *Heliconius erato** for which he proposed the name *extrema*. It formed a connecting link between *H. erato chesteroni* and *H. erato colombina*. It was remarked that both of these two occurred usually without any but the most trivial variation. Both occurred in the Cauca Valley of Colombia, over a great area from north to south. In addition to the form *extrema* three others were shown, which formed a graduating series to *colombina*; one of these being very similar to *extrema*, but showing faintly an indication of a transverse yellow band beneath, as well as a very small indication of the fore-wing red band as found in

* *Heliconius erato extrema*, nov. s. sp.

Fore-wing dark bluish black with a steely gloss. Except for a small red dot on the costa above discocellulars without markings. Hind-wing like fore-wing unicolorous dark bluish black. No trace of yellow transverse band either above or below. 1 ♂.

Hab. COLOMBIA, Cauca (?).

colombiana. These forms were purchased from a dealer with only the information "Colombia;" but it is almost certain that they came from some part of the Cauca Valley. *H. crato notina* fitted well into the connecting series, and had still more red of the fore-wing band. It was recorded from Valdivia, and was probably only an occasional aberration, as it was only known from the type specimen.

LARVAL SKINS OF DYTISCUS MARGINALIS AND HYDROPHILUS PICUS.—Mr. HUGH MAIN exhibited as transparencies in the epidiascope the larval skins of *Dytiscus marginalis*, which had been handed round at the meeting on Oct. 2. They appeared quite satisfactorily on the screen, showing the general characters and such details as the manner of deliscence of the skins and the fringes of hairs on the various appendages, etc. It was pointed out that the tail appendages in the first larval skin were only fringed on the outer side, while in the succeeding skins they were fringed on both sides. The moulted skins of the larva of *Hydrophilus picus* were also shown, and the spread-out empty skin of the pupa.

Such series illustrated very graphically the great increase in size of the larvæ in the very limited time in which they passed through this stage of their life-history, viz. just under eight weeks from hatching of the egg to disclosure of the pupa, in the case of both insects.

Mr. E. A. BUTLER commented on this exhibit.

SPECIAL MEETING.

Wednesday, November 6th, 1918.

Dr. C. J. GAHAN, M.A., D.Sc., President, in the Chair.

The Notice calling the Special Meeting was read by the SECRETARY, the object of the meeting being to make an alteration in Bye-law viii, the proposed change being supported by the TREASURER, the PRESIDENT, COMM. WALKER, Dr. CHAPMAN, the Rev. F. D. MORICK and Mr. JONES.

The TREASURER formally proposed to delete Clause 5 of Ch. viii, and to substitute:—

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"The Council shall nominate a chartered or incorporated Accountant annually, who shall audit the Treasurer's accounts. The Auditor shall be paid for his services a fee, the amount of which shall be agreed by the Council on behalf of the Society. The Treasurer shall furnish the Accountant with all the facilities he may require for auditing the accounts."

The Treasurer having fully explained his reasons for proposing this alteration, it was seconded by Dr. Chapman and carried *unm. con.*

ORDINARY MEETING.

Wednesday, November 6th, 1918.

Dr. C. J. GAHAN, M.A., D.Sc., President, in the Chair.

Tea Arrangements.

The SECRETARY announced that the Tea question having come before both the Business Committee and the Council, the following recommendation had been agreed upon:—that the tea subscription list should be circulated at every meeting till the Annual Meeting inclusive, and that as soon as the finances permit the tea should be provided at the expense of the Society.

Election of Fellows.

The Rev. FR. O'NEIL, S.J., Salisbury, Rhodesia; Messrs. ERNEST WILLIAM NIMMY, 210 Whippendell Road, Watford, Herts; R. STANWAY PARRIS, 6 High Street, Bishop's Stortford; the Rev. ALFRED T. STIFF, Grantham, Victor Drive, Leigh-on-Sea; Capt. WILLIAM HENRY TAPP, F.R.A.S., F.R.G.S., and Mrs. ELEANOR EVA TAPP, of Loos, 88 Wickham Way, Beckenham, Kent; and the Rev. E. ADRIAN WOODRUFFE-PEACOCK, F.L.S., F.G.S., Cadney Vicarage, Brigg, Lincolnshire, were elected Fellows of the Society.

Exhibitions.

ORTHOPTERA FROM SALONICA.—Mr. W. J. LUCAS, exhibiting some Orthoptera from Salonica, made the following observations :—

From time to time Mr. P. J. Barraul, one of the Fellows of this Society, has sent me insects from Salonica belonging to the orders Orthoptera, Odonata, and Neuroptera. This evening I have brought up the Orthoptera, mainly for the sake of a very interesting form of the common earwig *Forficula auricularia*, Linn. They comprise :—

Labidura riparia, Pall.—One male from Salt Lake near Narsh, Salonica-Janes Road, Aug. 4, 1918. It is scarcely as large as some of our south-coast examples and much darker in colour, unless this is due to change in drying.

Forficula auricularia, Linn. var.—Six males and three females. There is a large whitish spot on the wing-tips (sometimes indicated in British specimens); the colour is dark; and all the males sent have "high" callipers, the greatest length in a straight line from base to tip being 9 mm. It was common, or fairly so, in May and June 1917 and 1918, at Saracli (1000 ft.) and Paprat (2200 ft.). It was also found (females apparently) in winter at Basanli, hibernating in a rotten cherry log.

Empusa fasciata, Brullé.—A male, taken June 4, 1917, at Saracli.

Gryllotalpa gryllotalpa, Linn.—A female, from Kopriva, Struma Valley, Salonica. It was common at low elevations in April, May and June 1918.

MACEDONIAN ORTHOPTERA.—Captain BURR exhibited a series of Orthoptera from Macedonia, including *Saga natoliae*, *S. vittata*, and *Saga* sp. n.; also a pair of *Dinarchus dasypus*, Illig., and a small series of *Glyphanus heidreichi*, Br., a wingless Œdipodid, which assimilates very closely to the ground, but on jumping turns a somersault which flashes its white ventral surface; the inner face of the posterior femora are bright blue and lemon yellow, and the neck membrane bright indigo, but none of these brilliant colours are exposed under ordinary circumstances. It has been suggested that

they may serve as signals between individuals, as the creature is apparently mute. Also a small *Caloptenus italicus*, L., ♂, together with a *Sphinxonotus caeruleus*, L., ♀, which were taken *in copula*.

Mr. ROWLAND-BROWN inquired whether the Macedonian insects of other orders than Lepidoptera were predominantly Western. He had been struck by this characteristic of the butterflies sent to him from Salonica. Capt. BURR replied that this was so, and that the fauna of the northern Balkans was much richer than that of Macedonia, especially in the plains. He added that one rarely saw a bird either that one might not as well have met with in England.

CHALCID IN UNDIGESTED SEED. The PRESIDENT exhibited a Chalcid, *Torgus elegans*, Borkh., sent to him by the Rev. E. A. Woodruffe-Peacock, which had emerged from a hawthorn seed which had passed through the alimentary canal of a blackbird, together with the seed from which it had emerged. He said that it had been parasitic on some insect, probably a Cecidomyid, which had been feeding in the seed.

Mr. GREEN asked whether there were not Chalcids that fed directly upon seeds, and the President replied that this was the case, but that this species was parasitic.

Dr. NEAVE remarked that there were Chalcids that fed within the stones of almonds and plums.

BUTTERFLIES OF THE GENUS *CASTNIA* AND A MIMETIC *HESPERID*.—Mr. L. B. PROUT, on behalf of Mr. J. J. JOICEY, exhibited the following species :—

Castnia ergina, Westw. (P.Z.S., 1881, p. 111, pl. xii, fig. 4), paratypes out of the Druce collection, together with an apparently very rare Erycinid butterfly (genus *Xenandria*!) erroneously described by Druce as "*Castnia*" *pelopia* (E.M.M. xxvi, p. 69). Druce was evidently misled by the marvellous resemblance between these two, and did not examine the structure. A careful discussion of these forms by Houlbert (Oberth., "Ét. Lép." xv, pp. 651-8) is in part stultified by the fact that Westwood's figure is unrecognisable, showing a red band which is really wanting, in consequence of which he has thought to have discovered a new species *pelopioides*, which will really sink to *ergina*; in part also by Druce's

error above referred to. Although *erycina* is only definitely known from the Sarayacu district, while the only known examples of *pelopia* are from "interior of Colombia" and Chanchamayo (E. Peru), one cannot doubt that they will prove to occupy the same ground and to share in some mimetic association.

Also several new or doubtful forms of *Custania*, not yet fully worked out.

FURTHER OBSERVATIONS ON THE "CUCKOO-SPIT" INSECT.

The PRESIDENT stated that since the meeting on June 5th, when he gave a short account of his observations on the "cuckoo-spit" insect, he found that an elaborate and very interesting paper on the same subject had been published by Dr. Karel Šulc in November 1911. It was some satisfaction to him to know that while his own main observations turned out not to be new, they were almost in complete accord with those of the Bohemian entomologist. There was one fact, however, frequently observed by himself which seemed to have escaped the observation of Dr. Šulc and other writers on the subject. According to them, the liquid excreted from the anus accumulates beneath the body of the insect; and into this liquid the tip of the abdomen is dipped, and then the bubbles of froth are blown. But when the insect has moved away into a new position, bubbles are generally produced before there is sufficient liquid under the insect in which to dip the end of its body. What he saw happen on such occasions was this: the insect at first stretches out its abdomen, directing it obliquely upwards, and the lip of the valve which admits air to the ventral air-chamber are at this time kept open; this condition lasts awhile, and then the liquid coming from the anus forms a film across the open valve, the abdomen is now dipped downwards and a little to one side, and at the same time the lip of the valve gradually close, and the bubble, which during the process has been forming, is set free; the tip of the abdomen is again raised, and then dipped down towards the other side. In this way the bubbles are formed and deposited alternately right and left of the insect, and gradually are pressed forward along each side. He believed that it was the men- pressure exerted

by the bending down of the abdomen which forced the air from the air-chamber into each bubble. A consideration of the exact method by which the bubbles are formed was not without importance in relation to the question of what part, if any, the secretion of the wax-glands takes in giving to the liquid secretion from the anus its capacity for forming bubbles. Dr. Šulc explains that the wax is acted upon by an enzyme in the alimentary secretion, and the acid thus produced forms, with the alkali present, a substance which gives to the liquid the properties of a soap-solution. Although he had himself at first suspected that the wax might in some way impart to the liquid its tendency to form lasting bubbles, he was on the whole inclined to doubt whether that did actually take place.

As further points of interest in connection with the frog-hoppers, he stated (1) that the median triangular lobe which in the nymph fits in between the lateral folds of the 3rd abdominal segment and helps to close up the air-chamber in front, persists in the imago of many of the species, where it is no longer functional, and takes the form of a median ridge continued behind into a short, pointed process; and (2) that when examining some nymphs alive under the microscope, he found pulsatile organs, of the kind described in *Nepidae* and some other water-bugs, present in the tibiae of all the legs, and the movement of the blood corpuscles in the legs very distinctly visible. Organs of the same kind had quite recently been discovered by Richardson in the Aphididae, and probably occurred generally in the Rhynchota and possibly also in other insects. He thought it might be of interest also to mention that the froth produced by the frog-hopper was in the days of Queen Elizabeth known as "Woodseare," and he would like to find out whether that name has survived anywhere in the British Islands up to the present time. Bacon, in referring to the froth, said of it: "The experience is that the froth which they call *Woodseare* (being like a kind of spittle is found but upon certain herbs, and those hot ones; as *lavender*, *sage*, *hyssope*, &c. Of the cause of this enquire further, for it seemeth to be a secret." In a work published in 1664 it is referred to thus: "That spumeous froth or dew

which here in the North we call Cuckoo-spittle and in the South, Woodsear." Possibly some persons might be influenced in their choice between these two names if they knew what the old English entomologist Moufet, who died in 1604, had to say on the subject: "Angli spumeam illam materiam *Wood-seare* vocant; quasi diceres, silvarum tabem; Germani cuculi salivam esse autumant." Moufet was familiar with the insect which comes from the "Cuckoo-spit," and said he had no hesitation in calling it a little grasshopper ("Locustella") rather than a Cicada, as Isidore, Bishop of Seville, had stated it to be. Isidore, however, was not far wrong; and John Ray came still nearer to the truth when he named it "Cicadula."

Death of a Fellow.

Prof. POULTON said he was sure the Society would regret to hear that Mr. C. W. FARQUHARSON, who had done so much valuable work in Africa, had been drowned in the sinking of the *Burutu* when on his way home on leave.

Paper.

The following paper was read:—

"Notes on a large Heliconine Collection made in French Guiana in 1917, compared with a similar Collection made in 1915," by J. J. JOICEY, F.E.S., and W. J. KAYE, F.E.S.

Wednesday, November 20th, 1918.

Dr. C. J. GAHAN, M.A., D.Sc., President, in the Chair.

Election of a Fellow.

Mr. JOSEPH HERROD-HEMPSALL, Orchard House, Stockingstone Road, Round Green, Luton, Beds., was elected a Fellow of the Society.

Nomination of Officers and Council.

The following list of Fellows nominated by the Council to hold office during the ensuing year was read:—

President, COMM. JAMES J. WALKER, M.A., R.N., F.L.S.
Treasurer, W. G. SHELDON. *Secretaries*, REV. GEORGE
 WHEELER, M.A., F.Z.S.; DR. S. A. NEAVE, M.A., D.Sc., F.Z.S.
Librarian, GEORGE CHARLES CHAMPION, F.Z.S., A.L.S. *Other*
Members of Council, E. C. BEDWELL; G. T. BETHUNE-BAKER,
 F.L.S., F.Z.S.; KENNETH G. BLAIR, B.Sc.; MALCOLM CAMERON,
 M.B., R.N.; W. C. CRAWLEY, B.A.; J. HARTLEY DURRANT;
 DR. H. ELTRINGHAM, M.A., D.Sc., F.Z.S.; DR. C. J. GAHAN,
 M.A., D.Sc.; DR. A. D. IMMS, M.A., D.Sc., F.L.S.; DR. G. A. K.
 MARSHALL, D.Sc., F.Z.S.; REV. F. D. MORICE, M.A., F.Z.S.;
 HERBERT E. PAGE.

Exhibitions.

A NEW FORM OF MORPHO EUGENIA. MR. ARTHUR DICKSEE exhibited three specimens of a new race of *Morpho eugenia* from Colombia, from which it was hitherto unknown, together with two *Morpho eugenia* from French Guiana, and one *Morpho adonis* from French Guiana, and another from the Lower Amazons, for comparison.

He pointed out that the shape was half-way between the rounded form of *eugenia* and the pointed form of *adonis*, and that the colour approached more nearly to the colour of *adonis*, whereas the white costal markings approached more nearly to *M. eugenia*. He gave it the name of *Morpho eugenia*, form *danocles*. The locality is Villavicencio, Colombia, and the dates are May and June 1918.

MR. W. J. KAYE commented on this exhibit.

BRED LYCAENA ARION. Capt. PIERREY exhibited a score of home-bred *L. arion* together with their pupa cases.

He pointed out that the full-fed larva seldom, if ever, attempted to crawl far away from the ants in order to pupate. Larvae which he had kept both in the nests of *M. scabrinodis* and *M. lacinioides* generally fed in chambers deep down in the nest where the small ant larvae in their last instar were cared for by the workers. When the *arion* larva was full fed he generally remained where he was among the brood, slowly changing colour from a fine ochreous hite to a dead grey white. Six or seven days might elapse before the larval skin was cast. The ants were running over their guest all the time but never attacked him, even when the fresh pupa was

at its softest. The cremastral hooks would finally lose their hold of the silk pad and the pupa would lie at the bottom of the little earth chamber. When, after twenty-four days or so, the imago emerged, it had to find its way to the surface through the ant passages. This it never failed to do, and the freshly emerged butterfly would be found during the early morning drying its wings on the herbage growing on the nest.

Dr. CHAPMAN observed that when ants were placed in a new nest they refused to accept a larva of *L. alcon*, although they willingly accepted that of *L. ariop*.

DARKENING OF HIND-WING IN *MECHANITIS POLYMNIA*. Mr. W. J. KAYE exhibited six female *Mechanitis polymnia* from the Berbice River, caught at Friendship in July 1911 by Mr. H. C. Patoir, which all showed a very considerable darkening of the outer half of the hind-wing, one in particular having the whole outer half black. Two female *M. polymnia* were also shown from the Potaro River in Central British Guiana, which were the blackest that had been taken, one of which was figured in the Trans. Ent. Soc., pl. xxiii fig. 3, 1906. It certainly appeared as if towards Surinam the darkening in this species was more pronounced, and probably it would be found the same in the whole mimetic group of which *M. polymnia* was a member.

Paper.

The following paper was read :

"The Hymenoptera of Fiji," by ROWLAND E. TURNER, F.E.S.

Wednesday, December 4th, 1918.

Dr. C. J. GAHAN, M.A., D.Sc., President, in the Chair.

Nominations for Officers and Council.

No alternative names having been received, the list of the Council's nominees for office for the ensuing year was again read.

Election of Fellows.

Messrs. ANDERSON FERGUSON, 22 Polworth Gardens, Glasgow, W.; GEORGE GRACE, B.Sc., A.R.C.Sc., Inglenook, Utley, Keighley, Yorks, and P. V. ISAACS, B.A., Assistant Entomologist to the Madras Agricultural College and Research Institute, Coimbatore, India, were elected Fellows of the Society.

Exhibitions.

NEUROPTERA FROM SALONICA.—Mr. W. J. LUCAS exhibited the following *Neuroptera* from Salonica, sent to him by Mr. P. J. Barraud in 1916-1918, viz.:—

Nemoptera sinuata, Oliv., three; *Formicaleo tetragrammicus*, Fabr., one; *Myrmecaelurus trigrammus*, Pall, one; *Palpares libelluloides*, Linn., two, a male and a female; *Osmyglus chrysops*, Linn., two; *Ascalaphus macaronius*, Scop., var. *kolyvanensis*, Laxm., one male.

THE MALES OF *GLUTOPHRISSA EPAPHIA* AND *PHRISSURA SABINA* DISTINGUISHED BY THEIR SCENT-SCALES.—Dr. F. A. DIXEY exhibited specimens of the males and females of *G. epaphia* and *P. sabina*, with outline drawings of their scent-scales. He said:—

Among the Pierines which may be comprehensively ranked under the genus *Appias*, as now in the British Museum, there are two African forms which appeared in that collection until lately as *Glutophrissa epaphia*, Cram., and *Phrissura sabina*, Feld. The females of both these forms do not resemble their respective males, and also differ widely from each other; but the males, though generally distinguishable without much difficulty, are sometimes so much alike as to render their determination by ordinary methods doubtful. Aurivillius in Seitz's "Macrolepidoptera, Ethiopian Region," Eng. ed., p. 38, says of *G. epaphia*: "The ♂ nearly approaches that of *sabina*, but is smaller and the black dot at the end of vein 1 on the fore-wing above is always wanting." These, however, are not invariable means of distinction, for some individuals of *epaphia* are larger than some of *sabina*, and the black dot at the end of vein 1 may be wanting in the latter, especially in the form inhabiting Madagascar. I think, however, that the

males can always be distinguished by the shape of their scent-scales; the females, as above noticed, present no difficulty.

The scent-scales show some individual differences, but the laminae of those of *G. epaphia* appear always to have parallel sides, with a somewhat squared base and a comparatively shallow apex. In *P. sabina* the sides may be parallel or may be curved towards each other like a pair of parenthesis-marks, but the base is always rounded and the apex comparatively sharp. When the sides are parallel, the lamina of *P. sabina* may be called U-shaped; when they are curved, the lamina tends to become cordate. In either case it differs from the almost rectangular proximal portion of the lamina in *G. epaphia*. This distinction holds good not only for the continental forms of the two species, but also for their respective forms found in Madagascar.

It may here be worth while to point out that a certain amount of confusion exists with regard to the Madagascar form of *P. sabina*. The female of this subspecies was originally described and figured by Boisduval as *Pieris phileris*, ♀ ("Faun. Léop. de Madag.," p. 17, pl. 2, fig. 5). It does not, however, belong to the male *Pieris* (*Belenois*) *phileris* with which Boisduval associated it; and this author's name for it will therefore not stand. In 1872 it was included by Mr. Butler in his list of species of the old genus *Pieris* as *Belenois confusa* sp. n. Butler afterwards described a similar female as *Belenois conjata* ♂ ("Cist. Entom." 2, p. 391). Mabille ("Hist. Nat. de Madag., Lépid.," i. p. 263, pl. 31, figs. 5, 5A, 6, 6A) described and figured the form under Butler's name of *Pieris confusa*. His descriptions and figures of the "male" and female are, however, in every case those of the latter sex. These mistakes no doubt arose from the fact that in these two species, as in several other forms of the *Appius* group, the female as well as the male is furnished with a terminal tuft of hairs, quite distinct, though smaller than that of the males. This fact, together with the great diversity between the appearance of the sexes in *P. sabina* or *confusa*, and the ease with which the males of that species may be taken for those of *G. epaphia*, has led to the very natural

though erroneous conclusion that both sexes of *P. confusa* were represented in a series which consisted only of females. It seems probable that the male of *P. confusa* was really known to Mabille, but was not distinguished by him from the male of *G. epaphia*; for his figures of "*P. saba typica*, ♂," and "*P. saba* var. *epaphia*, ♂," might quite well be taken to represent males of *P. confusa* (*op. cit.*, pl. 36, figs. 3, 3a, 5, 5a).

THE RELATION OF THE AXAL TUFTS TO THE BRANDS OF THE HIND-WINGS OBSERVED AND THE SCENT PERCEIVED IN A MALE DANAINA BUTTERFLY BY W. A. LAMBORN.—Prof. POULTON gave an account of the following deeply interesting observations made at Tanga, late German East Africa, on Aug. 5, 1918, by Mr. W. A. Lamborn, in continuation of his S. Nigerian investigations, recorded in *Proc. Ent. Soc. Lond.*, 1911. xlv; 1912, xxxiv; 1913, lxxxiii, and those of Capt. Carpenter, *ibid.*, 1914. cxi :

"Aug. 5, 1918. To-day, a Bank Holiday, and kept as such even in Tanga, afforded me relief from the care of my usual 60 or 70 out-patients, and, the day being wet and dull at intervals, I was able to sit in my office, getting the hospital books in order, untroubled by any special hankering after the things of the bush. Then, after an early lunch, I sauntered out, at 1 p.m., to make further search for *Fleurya* or some plant near it; for all my recent rambles have been devoted to this object. At about two the sun suddenly came out brilliantly, arousing the insects; and the abundant *Amauris niaricus dominicanus*, Trimen, in particular claimed my attention, for even now, as in Nigeria, I still often confuse, for the few vital seconds, till they get to a distance, or unless they settle, *Amauris* and *Eurulia*. The majority of the *Amauris* came to rest after a short flight and sunned themselves, resting with wings approximated and then fully expanded, evidently enjoying the warmth. Suddenly my attention was attracted to a fine fresh male resting with expanded wings by the gleam in the sunshine of a white structure at the hinder end of its body. On near approach I discovered that this was due to the extrusion of the anal tufts, the gleam being due to the sunshine reflected off a

pencil of brownish white hairs resting on the inner side of the scent-patches. The outer black hairs were spread out fanwise, accurately covering the patch, the foremost hairs pointing towards the head of the insect, the middle hairs at right angles to the mid-line of the body, and the hindmost hairs pointing directly back. The abdomen of the insect at the junction of the 10th and 11th segments was strongly ante-flexed, the 9th and 10th segments being tumid, the 11th and 12th markedly constricted, an effect due, I thought, probably to the strong tonic action of a detrusor muscle concerned with the anal tufts. The butterfly remained motionless for some seconds in this attitude, and then regular but sudden movements of the wings took place, the fore-wings being approximated and then over-extended, the hind-wings following to about half-approximation and then also being over-extended. By this means a slight movement of the black hairs over the scent-patches only was effected. The operation took place 10 or 12 times in half as many seconds, and then, the tufts being withdrawn, the butterfly leisurely approximated its wings and flew away.

" I found that almost as many males as I followed, old worn specimens as well as fresh ones, eventually settled and performed the same operation, which I studied in several more. One, an old damaged insect, which had settled on a leaf, extruded its right white tuft, but could not at first manage to get out the left. I could see peristaltic waves of contraction passing down the last three segments of its ante-flexed abdomen, for half a minute to no purpose. The violent expulsive efforts then resulted in the extrusion of the two tufts, but even then it was only able to spread the black hairs of the left tuft over the corresponding patch. The brownish white tuft did not appear. The subsequent movements were as in the first-mentioned butterfly. It flew away after a time and again endeavoured to exert the paler tuft, but unsuccessfully.

" I then followed a second male and timed the operation by the second-hand of my watch. From the first extrusion of the tufts to their complete retraction lasted 1 minute, 40 seconds. These butterflies were so intent on their toilet

that I was able to approach my nose to within two or three inches of a third with tufts extruded. I experienced a sensation as if an aromatic snuff had impinged on the mucous membrane of my nostrils. Subsequently I seized by one wing a fourth butterfly with tufts extruded. They remained extruded in spite of its struggles, and on smelling them I experienced the same sensation."

The movements described in this valuable record strongly supported Dr. H. Eltringham's interpretation, in *Trans. Ent. Soc. Lond.*, 1913, p. 404, based on an examination of the structures in the laboratory :—

"We may suppose that the insect brushes out the secretion, the stiffer [darker] hairs probably assisting in lifting the covering scales. . . . It should be noted that these hairs are on the outer side of the brush, and would thus naturally come first into contact with the scent-patch."

Dr. Eltringham's researches showed that there was no special muscle directly concerned with the protrusion of the brushes. This was effected, as in many similarly eversible glandular and odoriferous structures, by the pressure of the fluids of the body. The constricted 11th and 12th segments and the peristaltic waves of contraction described by Mr. Lamborn were doubtless instrumental in producing this pressure.

A SUGGESTED INTERPRETATION OF THE SPECIAL ATTACKS MADE BY BLOOD-SUCKING DIPTERA ON NEW-COMERS INTO THE TROPICS AND OF THEIR GRADUAL DIMINUTION.—Prof. POULTON said that he had received the following suggestive notes from Mr. C. B. Williams, who had written from the Department of Agriculture, Trinidad, B.W.L., on Oct. 12, 1918 :—

"I got last mail Parts II, III and IV of the *Trans. Ent. Soc.* for 1917 (somewhat delayed!), and was particularly interested in a discussion (pp. lxxvii *et seq.*) on the attraction of insects to salts, perspiration, urine, etc., because it largely fits in with some of my own ideas and observations on the subject. I have ventured a little further, and have developed a theory which appears to me to be sound. It is that relative resistance to mosquito bites is due to differences in the composition, and hence the scent, of the perspiration, and further

that after residing for some time in a hot climate the relative proportions of various waste products secreted internally and externally alter. The composition of the perspiration alters and the individual becomes less attractive to mosquitoes than when newly arrived. In spite of the fact that new-comers perspire more freely than natives, who take things more gently, I believe that mosquitoes are not attracted by such differences in *quantity* but in the *quality* of the secretion. I admit nine-tenths of this is conjecture, but it is the only working hypothesis that I can get that will explain the facts. I have tested it for two years now. There seems to be no doubt whatever that a new arrival to the tropics is more worried and more bitten by mosquitoes. It is not a matter of suffering more from the bites. I still swell and suffer from any bite, but there are places where I can now sit in comfort where I was continually bitten on my first arrival; and I find that new-comers still suffer when sitting alongside me at these same places, so that there has been no reduction in the number of mosquitoes.

"Of course I know that the mosquito goes to get blood and not perspiration as in the case of the butterflies discussed in the P.E.S., but still it must be the scent of the perspiration that originally attracts them to their prey. Tabanids are blood-suckers, yet I have seen them attracted to a pair of socks just removed after a hot walk.

"I wonder if some Bio-Chemist could be persuaded to take up the study of the composition of perspiration in relation to climate and mosquito attraction. It seems to me that it might lead to the discovery of some attractive baits for mosquitoes and possibly even for tsetse flies, to which the reasoning might also apply.

"I was particularly pleased with the remark in the Proceedings about gout accounting for the non-attraction of butterflies to the perspiration of one individual. I believe gout is due to faulty kidney action, and this would of necessity have a direct effect on the composition of the perspiration.

"I should be very glad if you would let me know what you think of this idea. Quite possibly it has been proposed before, but if so I have not heard of it. If you think it of

sufficient interest you might perhaps put it before the Entomological Society, to be pulled to pieces by more experienced hands."

Prof. Poulton said that the hypothesis was quite new to him, and that he thought it was important to put it on record as soon as possible, so that Entomologists generally might test it by past experience and future specially directed observation.

Mr. BACOT said that experiments carried out in West Africa with *Stegomyia* supported Mr. Williams' theory; Mr. E. E. GREEN had found that during the whole of his residence in Ceylon he remained equally affected by the bites of mosquitoes, but that in England, though much attacked, he suffered no inconvenience from them. Mr. H. DOLLMAN and the Rev. G. WHEELER gave evidence from personal experience from residence in Central South Africa and Switzerland respectively, supporting the view that partial or even complete immunity was acquired after a time, and Mr. BACOT added evidence that this immunity lasts for many years. Dr. LONGSTAFF and Mr. BETHUNE-BAKER also adduced similar evidence with regard to the stings of bees and wasps. Mr. MALCOLM CAMEROX pointed out that the personal element had also to be considered, insects attacking some people much more readily and persistently than others.

RHOALOCERA FROM SOUTH CENTRAL AFRICA.—Mr. H. DOLLMAN exhibited two series of some thirty specimens each of bred *Charaxes*: they represented two distinct species of the "*etheodes*" group, the one having the ♂ form of *manica*, Trim. (resembling small ♀ *bohmanni*), the other having the ♀ form of *phaeus*, Hew. (resembling small ♂ *bohmanni*).

It was pointed out that there were constant and readily seen differentia in the respective males, and that in the great number of females bred the latter had never departed from the forms exhibited. The *phaeus* form having been bred in every month of the year, and the *manica* form, though not so extensively, but throughout several months (inclusive of the extreme wet and extreme dry periods), it may perhaps be concluded that there is no marked seasonal instability of either sex of the two species in this locality. The respective

larvae, drawings of which were shown, are quite distinct, both superficially and structurally. They feed on different leguminous trees—the *manica* form on an "acacia" called in Chikaonde "*musasi*," the *phaeus* form on an "acacia" called "*kabulwebulce*."

The pupae also show distinctive characters; these are small but quite constant.

The experiments were conducted at Solwezi, Kasempa District, in South Central Africa, close to the Katanga boundary. The *phaeus* form had not been observed further south, but *manica* had been taken sparingly near to Broken Hill and Kashitu.

The exhibitor expressed the opinion that the two species were undoubtedly distinct.

He also exhibited a drawer of Nymphaline butterflies and details of their life-history. The first two species were *Hamanumida daedulus*, Fabr., and *Crenidomimas concordia*, Hopff., their pupae, and drawings of their larvae. The larva of *Crenidomimas*, previously unknown, was shown to be exceedingly similar to the well-known *Hamanumida*; their food-plants are different. *Dictogyna iris*, Auriv., was mentioned as having the same type of larva, of which, unfortunately, no drawing had been made. It feeds upon the big-leaved "*musuku*" tree. In the same exhibit was a bred series of *Pseudacraea poggei*, Dewitz, its pupae, and figures of the larva. Previously undescribed, the larva and pupa are of interest as showing such very close resemblance to the congeneric species. The larvae, though found in some numbers, are restricted to one kind of shrub—"tandokatuli" (Chikaonde). The pupae are very freely parasitised by a small Tachinid fly. All the material of the second exhibit was from South Central Africa—either N.W. Rhodesia or the Katanga.

Prof. POULTON and Lord ROTHSCHILD commented on this exhibit.

A LOCAL RACE OF *PRECIS OCTAVIA*.—Lord ROTHSCHILD exhibited a series of a local race of *Precis octavia* from Temboora, Baht-el-Gazal, and drew attention to the extraordinary number of intermediate specimens among the series of the dry-season form—14 out of 16. He also exhibited a series of wet- and

dry-season forms with intermediates of *Precis octavia octavia*, Cram., and *Precis octavia sesamus*, Trimen, from West and South Africa respectively, for comparison. He also remarked on a series from the Nuba Hills, Soudan, exhibited by Prof. Poulton, and pointed out that, contrary to the Tembora series, the dry-season forms were all pure dry-season, no intermediates being present. The wet-season form appears also to be paler.

Dr. G. A. K. MARSHALL said that he had bred many intermediates under abnormal conditions, and that any kind of shock seemed efficacious in bringing about this result.

Lord ROTHSCHILD said that in experiments on *Aglaia urticae* he had found that it was only during a very short period just before hardening that the pupa was susceptible to surrounding influences.

Paper.

The following paper was read :—

"Butterfly Vision," by H. ELTRINGHAM, M.A., D.Sc., F.Z.S. The paper was illustrated by means of lantern slides showing the structure and optical action of the butterfly eye, and the author also described and illustrated a series of experiments designed to test the capacity of butterflies for perceiving colours. He had arrived at the conclusion that the optical image provided for the perception of the insect's brain was at least eight times more distinct than had been supposed under previous theories, and also that though the butterflies with which he had experimented were in some cases rather "short" at the red end of the spectrum, there was strong evidence that they could distinguish at least those colours with which they were associated in life.

Dr. LONGSTAFF warmly complimented the author on his paper and recalled one of his own observations in Jamaica where a yellow butterfly had selected and settled upon a yellow leaf lying on a wide area of uniform green. Dr. Eltringham had mentioned a very remarkable fact in connection with the actinic properties of the yellow flowers of the *Rudbeckia*, and he had himself observed the overwhelmingly brilliant effect of

this flower growing near Quebec against a dark background of leaves.

Mr. BACOT recalled the theory that the colours of flowers had been developed in response to the tastes of insects.

Dr. DIXEY, Mr. BETHUNE-BAKER and others also contributed to the discussion.

Dr. Eltringham in reply said that he had been able to give only an abstract of his paper, and that the points raised would be found more fully discussed in the complete publication.

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THE ANNUAL MEETING.

The Annual Meeting took place on Wednesday, January 15th, 1919, Dr. C. J. GAHAN, M.A., D.Sc., President, being in the Chair.

The TREASURER, after explaining the position of affairs under the new bye-law governing the audit, read his Statement of Accounts, which was adopted on the motion of Mr. W. J. LUCAS, seconded by Mr. HUGH MAIN.

The Rev. G. WHEELER, one of the Secretaries, then read the following

Report of the Council.

Adverse circumstances notwithstanding, the condition of the Society may be described as distinctly flourishing, our numbers having again risen above 600. We have lost six Fellows by death and eight by resignation; none have been removed from the list. Twenty-one new Fellows have been elected to the Society, and M. PAUL MARCHAL was elected early in the year to succeed to the Honorary Fellowship rendered vacant by the death of Dr. EMIL FREY-GESSNER, of Geneva, at the end of 1917. The Society now consists of twelve Honorary Fellows, two Special Life Fellows, and five hundred and ninety-one ordinary Fellows, making a total of six hundred and five. Of those lost by death Capt. CHARLES EMMETT and Mr. C. JEMMETT gave their lives for their country, and Mr. C. O. FARQUHARSON, who was doing admirable entomological work in Africa, was drowned in the collision of the *Burutu*, when returning home on leave; the remaining three were Mr. E. A. AGAR of Dominica, the Rev. F. E. LOWE, and Col. J. G. PILCHER.

Owing to the great increase in the expense of printing, the volume of the Transactions for 1917 will of necessity be the smallest published for some years. It will consist of

327 pages, illustrated by thirteen half-tone plates, two line blocks and a sketch-map, and contain sixteen papers by the following authors :—Mr. MALCOLM CAMERON, M.B., R.N. (2); Dr. F. A. DIXEY, M.A., M.D., F.R.S. (2); Messrs. E. DUKINFELD JONES; E. E. GREEN; the late ANTOINE GROUVELLE (communicated by Mr. HUGH SCOTT, M.A.); J. J. JOICEY and W. J. KAYE in conjunction; K. KUNHI KANNAN, M.A.; Rev. F. D. MORICE, M.A.; Mr. FREDERICK MUIR; Lord ROTHSCHILD, F.R.S., F.L.S., F.Z.S.; Mr. DAVID SHARP, M.A., M.B., F.R.S.; Dr. A. JEFFERIES TURNER, M.D.; and Mr. ROWLAND E. TURNER, F.Z.S. (2). The cost of reproduction of Mr. DUKINFELD JONES's plates was partly borne by the Author, and Mr. J. J. JOICEY has given the whole expenses of the sketch-map; the cost of reproduction of all the other plates has been borne by the Society, but the originals have in all cases been presented by the authors. Five papers are concerned with the Coleoptera, five with the Lepidoptera, three with the Hymenoptera, two with the Hemiptera, and one is on Nomenclature. The Proceedings will consist of nearly 180 pages and one line-block plate.

At a special Meeting on November 6th an alteration was effected in the bye-laws with the view of appointing a professional Auditor.

The meetings have not been so fully attended as in late years, but the papers and exhibits have fully maintained their interest.

The Council has resolved to appoint a sub-committee to consider the question of better accommodation for the Society, and to approach the Government on the question, if thought advisable, but the actual nomination of the Fellows who shall serve upon this sub-committee has been left to the incoming Council.

As some confusion seems to have been caused by the apparent discrepancies between the two Lists of Fellows published annually, it may be well to explain that the List issued in Part V contains the names of all who have been Fellows during any part of the year to which the Part refers, and therefore includes the names of all those who have died, resigned, or been removed during the course of the year,

while the List published separately consists of the names of those only who are actually Fellows at the time of going to press. This latter List can only be issued, for technical reasons, after the publication of Part V of the previous year.

The TREASURER reports as follows :—

“ The Income for 1918 shows an increase on that of 1917 of £236 9s. 2d., the details of which are as follows :—

	1917.	1918.	Comparison.
	£ s. d.	£ s. d.	£ s. d.
Interest	37 2 11	55 10 1 +	18 7 2
Admission Fees	25 4 0	31 10 0 +	6 6 0
Annual Contributions—			
Current Year	390 12 0	476 14 0 +	86 2 0
Arrears	45 3 0	186 18 6 +	141 15 6
Sale of Publications . . .	144 9 10	154 0 11 +	9 11 1
Donations—			
In Aid of Publications	11 8 8	5 13 7 —	5 15 1
„ „ Tea Fund . . .	3 2 6	14 15 0 +	11 12 6
„ „ Library	31 10 0	N.R.	— 31 10 0
	£688 12 11	£926 3 1 +	£236 9 2

“ This increase in income consists very largely of increases in the Annual Contributions, for 1918, and for arrears. It must be remembered that the more favourable state of affairs in this respect arises in great part owing to the severe and prolonged illness of the late Treasurer, Mr. A. H. Jones.

“ The surest test of the Society's financial condition, from an income point of view, is undoubtedly the number of subscribers who pay their contributions within the year in which they are due. In 1913, the year before the war, the number of Fellows who paid their subscription within the year was 467; in 1914—the high-water mark—472; in 1915, 452; in 1916, 414; in 1917, 372; and in 1918, 455. It has been very difficult during the past year to get into touch with many of the subscribers who reside in remote parts of the world. The restrictions of intercourse will now be removed, and I trust that at the end of this year I shall be able to record a result as favourable as that of 1915.

“ The reasons which have made it difficult to obtain subscriptions for the current year apply also to the arrears, the

total of which on January 1st, 1918, amounted to £291 8s. 5*d.*, due from 151 contributors. This on the 31st of December last had been reduced to £117 10s. 11*d.*, due from 69 contributors. I feel quite sure that this item will be very much less at the end of this year.

"The expenditure has been largely influenced by the reduction in volume of the Publications. The net result of the increase in income, and reduction in expenditure, is, that the Society has a balance in hand, after allowing for the liabilities, of £298 15s. 5*d.*, as against 17s. 10*d.* on January 1st, 1918.

"It must, however, be borne in mind that the cost of certain items of expenditure, and especially publishing, have greatly increased during the past year. The cost of this item over pre-war rates is about double, and although this may, and I hope will, be modified when conditions become normal, there is unfortunately no doubt but that a large portion will be permanent.

"The value of the Society's investments in consequence of the improved national situation has increased during the year by £68 5s. 11*d.* In the statement of assets and liabilities the value of the Library has not been taken into account. In the last statement it was estimated at £3,800; probably at the present time the value is considerably more than this; the Library is now insured for £4,375. The Stock of the Society's Publications is insured for £600.

"W. G. SHELTON.

"*Treasurer.*"

The following is the Report of the LIBRARIAN:—

"Three hundred and thirty volumes have been issued from the Library for home reading. Twenty volumes and a large quantity of Separata have been presented to the Library. As was the case the previous year, very few foreign periodicals have come to hand. The Library has again been largely used for purposes of reference."

The Report was adopted on the motion of Mr. E. E. GREEN, seconded by Mr. JANSON.

No alternative names having been received, the President declared the following Fellows, nominated by the Council,

to be appointed as Officers and Council for the ensuing year:—

President, COMM. JAMES J. WALKER, M.A., R.N., F.L.S.
Treasurer, W. G. SHELTON. *Secretaries*, Rev. GEORGE WHEELER, M.A., F.Z.S.; Dr. S. A. NEAVE, M.A., D.Sc., F.Z.S.
Librarian, GEORGE CHARLES CHAMPION, F.Z.S., A.L.S. *Other Members of Council*, E. C. BEDWELL; G. T. BETHUNE-BAKER, F.L.S., F.Z.S.; KENNETH G. BLAIR, B.Sc.; MALCOLM CAMERON, M.B., R.N.; W. C. CRAWLEY, B.A.; J. HARTLEY DURRANT; Dr. H. ELTRINGHAM, M.A., D.Sc., F.Z.S.; Dr. C. J. GAHAN, M.A., D.Sc.; Dr. A. D. IMMS, M.A., D.Sc., F.L.S.; Dr. G. A. K. MARSHALL, D.Sc., F.Z.S.; Rev. F. D. MORICE, M.A., F.Z.S.; HERBERT E. PAGE.

The PRESIDENT then delivered an Address, after which a Vote of Thanks to him was proposed by Dr. LONGSTAFF, and seconded by Mr. J. H. DURRANT, to which Dr. GAHAN made a reply.

Prof. POULTON then proposed a Vote of Thanks to the other Officers, remarking on the difficulties with which they had had to contend this year and on the flourishing condition of the Society notwithstanding. This was seconded by Mr. R. ADKIN. The TREASURER and both SECRETARIES said a few words in reply.

THE ENTOMOLOGICAL SOCIETY OF LONDON.
TREASURER'S ACCOUNTS for the Year ending December 31, 1918.
Presented at the Annual Meeting, January 15, 1919.

RECEIPTS AND PAYMENTS ACCOUNT.

RECEIPTS.		PAYMENTS.	
	£ s. d.		£ s. d.
To Balance as per last Account—		By Rent	70 7 6
General Account £294 18 8		" Salaries	50 0 0
Westwood Bequest Fund... 87 19 2		" Library—	
		New Books ... £4 12 2	
		Binding Repairs	
		and Insurance 18 18 5	
" Interest on Investments—			23 10 7
Dividend on		" Cost of Publications—	
Consols ... £33 17 0		Printing ... £240 15 1	
Interest on Deposit ... 14 9 5		Illustrations 50 14 3	
Interest on		Distribution 20 9 1	
Birmingham			311 18 5
3 % Stock... 7 3 8		" Sundry Printing and	
		Stationery	23 6 6
" Admission Fees ... 31 10 0		Postage	13 12 10
" Annual Contributions 1918 £476 14 0		Tea and Light Refreshments 13 19 0	
Arrears ... 166 18 6		Miscellaneous Payments... 16 4 8	
In Advance ... 21 0 0		" Balance at Bankers—	
		On General	
		Account ... £725 16 7	
" Compositions ... 15 15 0		On Tea Fund	
" Sales of Publications ... 154 0 11		Account ... 11 0	
" Donations—			£736 7 7
In aid of Publications ... £5 13 7		On Westwood	
In aid of Tea		Bequest Fund	
Fund ... 14 15 0		Account ... 95 2 10	
			821 10 5
		" Cash in hand on Tea Fund	
		Account	5 0
			£1,344 14 11
	<u>£1,344 14 11</u>		

WESTWOOD BEQUEST FUND.

	£ s. d.		£ s. d.
To Balance at Bank, Jan. 1, 1918	87 19 2	By Expenditure on Illustrations	—
" Interest on Birmingham Corporation 3 % Stock 7 3 8		" Balance at Bank, Dec. 31, 1918	95 2 10
	<u>£95 2 10</u>		<u>£95 2 10</u>

TEA FUND.

	£ s. d.		£ s. d.
To Donations	14 15 0	By Tea and Light Refreshments	13 19 0
		" Balance at Bank,	
		Dec. 31, 1918 £ 11 0	
		" Cash in Treasurer's	
		hands	5 0
			16 0
	<u>£14 15 0</u>		<u>£14 15 0</u>

W. G. SHELDON, *Treasurer.*

We have examined the above Account of Receipts and Payments with the Books and Vouchers produced to us and certify it to be in accordance therewith.

The Bankers have certified the correctness of the Cash Balance, and that they hold the Securities for the Investments.

(Signed) W. B. KEEN & Co., Chartered Accountants.

28, Queen Victoria Street,
London E.C.4

MEMORANDUM
AS TO ASSETS AND LIABILITIES AT DECEMBER 31, 1918.

ASSETS.			LIABILITIES.		
	£	s. d.		£	s. d.
To Arrears of Annual Contributions... £147 10 11			By Cost of Printing Transactions Part V, 1917; Parts I—V, 1918; Cost of Plates and Sundry Unpaid Accounts; and Cost of Postage on Transactions due to Fellows residing abroad and at present undelivered ...	523	0 0
Less Amount not considered good	63	10 11			
		84 0 0			
„ Present value of—					
£1,351 2s. 2d.					
Coupons 2½ % at 59 (cost £1,233 3s.) ... £738 17 2					
£239 12s. 4d.					
Birmingham Corporation 3 % Stock at 62 (cost £250)	148	16 0			
		947 13 2			
„ Balance at Bankers, Dec. 31, 1918—					
On Deposit Account £600 0 0					
On Current Account 221 10 5					
		821 10 5			

W. G. SHELDON, *Treasurer*.

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ERRATA.

TRANSACTIONS.

- Page 185, description of text figure 55, for *piniorus* read *piniarius*.
Page 228, line 2 from bottom, for *Dermestis* read *Dermestes*.

PROCEEDINGS.

- Page lxxxvii, l. 7, for *johanna* read *johannae*.
Page cxiv, l. 15, for *cleodora* read *cleodora*.
Page cxxiii, l. 18, for only slightly yellowish read not quite so yellowish.
Page cxlii, line 8, for Braconid read Braconoid.
Page cli, line 13 from bottom, for evagone read evagore.
Page clxvii, l. 18, for C. W. Farquharson read C. O. Farquharson.

TRANSACTIONS.

- Page 234, line 8 from bottom, for *flavogattatum*, n. sp., read *flavoguttatum*, n. sp.
Page 241, line 3 from bottom, for *Mimocyplus* read *Mimocyptus*.

